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Science & Technology

Central Eurasia

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Russian Presidential Edict on State Science Centers

947A0042A Moscow ROSSIYSKAYA GAZETA in Russian 6 Apr 94 p 4

[Article by V. Chernomyrdin, chairman, Government of the Russian Federation: "Implementation of Edict of President of the Russian Federation, No. 939, 22 June 1993," "On State Science Centers in the Russian Federation"]

[Text] In implementation of the edict of the president of the Russian Federation dated 22 June 1993, entitled "On State Science Centers in the Russian Federation" and for the purposes of extending state support to the activity of these centers, the Government of the Russian Federation decrees:

1. Adoption of the proposal of the Interdepartmental Coordination Commission for Scientific and Technical Policy on awarding the status of state science center of the Russian Federation to the Central Aerohydrodynamics Institute imeni Professor N. Ye. Zhukovskiy, the Physicochemical Scientific Research Center imeni L. Ya. Karpov, the Central Aviation Engine Building Institute imeni P. I. Varanov, the Physics and Power Engineering Institute, the All-Russian Aviation Materials Scientific Research Institute, the Vektor Scientific Production Association, the All-Russian Electrical Engineering Institute imeni V. I. Lenin, the State Aviation Systems Scientific Research Institute, the State Scientific Research Institute of Genetics and Selection of Industrial Microorganisms, the Flight Research Institute imeni M. M. Gromov and the Nuclear Reactors Scientific Research Institute.

2. Approval of the proposed:

- Regulations on the conditions for state support of the Science Center of the Russian Federation—the Central Aerohydrodynamics Institute imeni Professor N. Ye. Zhukovskiy;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the Physicochemical Scientific Research Institute imeni L. Ya. Karpov;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the Central Aviation Engine Building Institute imeni P. I. Varanov;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the Physics and Power Engineering Institute;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the All-Russian Aviation Materials Scientific Research Institute;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the Vektor Scientific Production Association;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the All-Union Electrical Engineering Institute imeni V. I. Lenin;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the State Aviation Systems Scientific Research Institute;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the State Scientific Research Institute of Genetics and Selection of Industrial Microorganisms;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the Flight Research Institute imeni M. M. Gromov;
- Regulations on the conditions for state support of the State Science Center of the Russian Federation—the Nuclear Reactors Scientific Research Institute.

Note. The enumerated regulations are not published.

Nuclear Radiation Safety Issues Detailed

Statute Issued

944E0778A Moscow ROSSIYSKIYE VESTI in Russian 27 Apr 94 p 5

[Statute of Russian Federal Oversight of Nuclear and Radiation Safety: "On Organizing and Making Expert Examinations of Planning and Other Materials and Documents Substantiating the Safety of Nuclear- and Radiation-Hazardous Objects (Products) and Production Facilities (Technology)": registered at Russian Federation Ministry of Justice on 18 April 1994, registration No. 547; approved by Order No. 41 of Russian Gosatomnadzor [Federal Oversight of Nuclear and Radiation Safety] of 7 April 1994, RD-03-13-94]

[Text]

1. General Points

1.1. This Statute was drawn up on the basis of:

—the Statute on Russian Federal Oversight of Nuclear and Radiation Safety, approved by Order of the President of the Russian Federation of 5 June 1992, No. 283-rp, with amendments approved by Order of the President of the Russian Federation of 16 September 1993, No. 636-rp;

—the guiding and regulatory documents establishing the competence and rights of the structural subdivisions, institutions and regional bodies included in the Russian Gosatomnadzor system;

—the guiding documents of Russian Gosatomnadzor on issuing permits (licenses) for types of activity.

1.2. The requirements of this Statute are compulsory for:

—structural subdivisions of the central staff and regional bodies of Russian Gosatomnadzor, the competence of which includes regulation and oversight of nuclear- and/or radiation-hazardous objects (products) and production facilities (technology);

—enterprises, the activity of which can be carried out only on the basis of permits (licenses) obtained at the organs of Russian Gosatomnadzor (henceforth the declarant);

—enterprises (organizations, institutions) regardless of the forms of ownership and departmental affiliation, including those created (founded) or included in the system of Russian Gosatomnadzor (Scientific-Technical Center for Nuclear and Radiation Safety (NTTs YaRB), expert-technical centers, etc.) and specialists recognized in accordance with the established procedure by Russian Gosatomnadzor as competent in questions of the safety of the corresponding nuclear-and/or radiation-hazardous objects (products) and production facilities (technology), and drawn into organizing and carrying out expert examinations (henceforth respectively expert enterprise and expert).

1.3. The objects of expert examinations are the planning and other materials and documents substantiating the safety of nuclear- and/or radiation-hazardous objects (products) and production facilities (technology) (henceforth substantiating documents).

1.4. The purpose of carrying out the expert examinations is to evaluate the information presented regarding the safety of nuclear- and/or radiation-hazardous objects (products) and production facilities (technology) at all stages of their vital cycle with respect to its conformance to the demands of Russian Federation legislation, the criteria, rules and norms for nuclear and radiation safety and the guiding documents of Russian Gosatomnadzor.

1.5. The need to carry out expert examinations of planning and other materials and documents is established by Russian Gosatomnadzor. The requirement of Russian Gosatomnadzor that an expert examination be carried out is compulsory for the declarant.

1.6. The list of substantiating documents subject to expert examination is determined by Russian Gosatomnadzor in accordance with the requirements set forth in the guiding documents for the contents of the application to obtain a permit (license) for the stated type of activity or application for a correction of the conditions of its force.

Russian Gosatomnadzor, with the initial monitoring of the materials of the application to obtain a permit for the type of activity, and in the process of carrying out the expert examination, may make the decision on the need for the declarant to submit additional documents.

1.7. Russian Gosatomnadzor uses the results of the expert examination when deciding whether to issue or refuse to issue the declarant a permit (license) for the corresponding type of activity or a change in the conditions for its force.

When the conclusions of the expert examination are unfavorable, no decision is made on issuing the permit (license) or changing the conditions for its force.

1.8. The procedure for carrying out the expert examination of the planning and other materials and documents substantiating the safety of nuclear weapons and objects of the nuclear-weapons complex at all stages of the vital cycle is determined by a separate statute.

2. Organizing the Expert Examination

2.1. The decision on the need to carry out an expert examination of the substantiating documents is made by the sectorial administration of Russian Gosatomnadzor, the competence of which includes the regulation and oversight of the safety of the corresponding nuclear- and/or radiation-hazardous objects (products) and production facilities (technology) (by the district administration of Russian Gosatomnadzor for permits issued by regional bodies).

2.2. The declarant submits the basic documents for carrying out the expert examination to Russian Gosatomnadzor, in the number of copies agreed on in advance.

2.3. The declarant is obliged to present a letter guaranteeing payment for the work of the expert enterprise in carrying out the expert examination.

2.4. The sectorial administration, if it decides to carry out an expert examination, sends the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor the substantiating documents and proposals on organizing the expert examination with instructions on:

—the periods for carrying out the expert examination;

—the volume and purpose of carrying it out.

2.5. The Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor for permits issued by regional bodies) draws up:

—the assignment for an expert enterprise to carry out the expert examination and the schedule for carrying out the expert examination, and submits them to the sectorial administration, expert enterprise and (if required in the assignment) to the declarant for approval;

—proposals on the list of experts being drawn in, and submits them to the sectorial administration and the expert enterprise for approval.

2.6. The draft of the assignment for carrying out the expert examination may be drawn up by the declarant or the expert enterprise.

2.7. The Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor for permits issued by regional bodies) forms an expert commission to coordinate work on the expert examination and the analysis and correlation of its results.

The staff of the expert commission is submitted to the sectorial Administration for approval and, if necessary, to other concerned subdivisions and regional bodies of Russian Gosatomnadzor, and is approved by the deputy chairman of Russian Gosatomnadzor

acting as liaison for the corresponding form of activity (chief of the district administration for permits issued by regional bodies).

2.8. The staff of the expert commission includes:

—the coordinator of the expert examination (chairman of the expert commission)—representative of the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (representative of the regional body of Russian Gosatomnadzor, responsible for organizing the expert examination on safety of the corresponding nuclear- and or radiation-hazardous objects (products) and production facilities (technology), for permits issued by regional bodies), and other staff members of this subdivision (when necessary);

—representatives of the sectorial administration (representatives of the regional body of Russian Gosatomnadzor, carrying out oversight of safety of the corresponding nuclear- and or radiation-hazardous objects (products) and production facilities (technology), for permits issued by regional bodies);

—representatives of the NTTs YaRB, concerned subdivisions and regional organs of Russian Gosatomnadzor (when necessary);

—representatives of enterprises and organizations, to consider special problems (when necessary, and by agreement with their management).

For expert examination of complex objects, a subcommission for individual points of the expert examination may be formed within the staff of the expert commission.

2.9. The assignment to carry out the expert examination, the schedule for carrying out the expert examination and the staff of the expert commission are approved by the chief of the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (chief of the district administration of Russian Gosatomnadzor, for permits issued by regional bodies) within one month from receipt of the substantiating documents by this administration.

2.10. The enterprises and specialists which are the executors or co-executors of the substantiating documents (draw them up) may not be involved in the carrying out of the expert examination.

2.11. Only experts having the appropriate permission to work with documents containing information which constitutes a state secret can be drawn in to expert examination of such substantiating documents.

2.12. The Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor for permits issued by regional bodies) sends:

—to the declarant (if required in the assignment) and expert enterprise, the approved assignment for carrying out the expert examination, the schedule of the expert examination and a list of members of the expert commission;

—to the expert enterprise, the [illegible] ments, submitted by the declarant [illegible] out the application.

2.13. On the basis of the approved assignment [illegible] the expert examination [illegible] contract with the expert enterprise.

3. Carrying Out the Expert Examination

3.1. The expert examination [illegible] enterprises and experts indicated [illegible] Statute.

3.2. The expert enterprise carries out an expert examination of the substantiating documents, drawing up the decisions, specified by the assignment, on the substantiating documents and points of the expert examination and a draft of the consolidated report (decision) and presents them to the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor for permits issued by regional bodies).

3.3. The expert commission, if necessary in the process of carrying out the expert examination, organizes a discussion with the expert enterprise, experts and declarant of the preliminary results of the expert examination, and also of the expert decisions and draft of the consolidated report (decision).

The results of the discussion are recorded in a protocol, approved by the chief of the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (by the chief of the district administration of Russian Gosatomnadzor, for permits issued by regional bodies).

The declarant must, in accordance with the protocol:

—make corrections in the substantiating documents in accordance with the established procedure;

—present additional substantiating documents.

If the substantiating materials are further developed or additional ones are presented, the period for carrying out the expert examination may be increased by decision of the chief of the Administration for Organization of Expert Examination on Safety (submitted for approval to the sectorial administration within the limits of the period established for considering the applications), or the deputy chairman of Russian Gosatomnadzor acting as liaison for the corresponding type of activity (over and above this period) (chief of the district administration of Russian Gosatomnadzor for permits issued by regional bodies).

3.4. The expert decisions on individual substantiating documents and or on individual points of the expert examination should meet the requirements for an expert decision set forth in the appendix to this Statute, and the requirements of the assignment.

3.5. The final document for expert examination is the consolidated report (decision), which is as a rule drawn up on the basis of the expert decisions on

individual substantiating documents and points of the expert examination, and should contain:

—information on the nuclear- and radiation-hazardous object (product) or production facilities (technology), its developers and the substantiating documents;

—information on modifications in the object (product) or production facilities (technology) and amendments in the substantiating documents;

—information on unsolved problems and the program for their solution;

—analysis of the documents substantiating the application, and the results of calculation and experimental checks made of the substantiations presented;

—conclusions on the authenticity and adequacy of the substantiations presented;

—evaluation of the conformance of the information presented on safety of nuclear- and/or radiation-hazardous objects (products) and production facilities (technology) to the requirements of Russian Federation legislation, the criteria, rules and norms on nuclear and radiation safety and the guiding documents of Russian Gosatomnadzor;

—a decision on the possibility of issuing the declarant a permit (license) for its stated activity or on the corrections in the conditions for force of the permits (licenses) obtained by the declarant;

—a proposal on including requirements to ensure nuclear and radiation safety in the conditions for the permit (license) to be in force.

3.6. On the basis of the requirements of the assignment for carrying out an expert examination and the schedule for the expert examination, a draft of the consolidated report (decision) is drawn up by the expert enterprise or expert commission.

3.7. If a draft of the consolidated report (decision) is drawn up by the expert enterprise, it presents the expert decisions and the draft of the consolidated report (decision), signed by the director of the expert enterprise, to the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor for permits issued by regional bodies).

The expert commission checks the conformance of the materials presented by the expert enterprise to the requirements of the assignment for the expert examination, the requirements for the expert decision and the requirements indicated in p. 3.4.

If the expert decisions or draft of the consolidated report (decision) fail to correspond to the established requirements, the expert commission returns them to the expert enterprise for further development and repeat presentation.

The consolidated report (decision) is approved by the chief of the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (by the chief of the district administration of Russian Gosatomnadzor for permits issued by regional bodies).

3.8. If a draft of the consolidated report (decision) is drawn up by the expert commission, the expert decisions are sent by the expert enterprise to the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor for permits issued by regional bodies).

The expert commission determines the conformance of the materials presented by the expert enterprise to the requirements of the assignment for expert examination and the requirements for the expert decision.

If the expert decisions fail to conform to the established requirements, the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor, for permits issued by regional bodies), they are returned to the expert enterprise for further development and repeat presentation.

The expert commission, on the basis of the expert decisions, draws up the consolidated report and presents it for approval to the chief of the Administration for Organization of the Expert Examination on Safety of Russian Gosatomnadzor (to the chief of the district administration of Russian Gosatomnadzor, for permits issued by regional bodies).

3.9. The Transfer and Acceptance Act for the work and its stages, upon agreement between the expert enterprise and the declarant, is formalized after a check by the expert commission of the materials presented by the expert enterprise and the approval of the act by the chief of the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (by the chief of the district administration of Russian Gosatomnadzor, for permits issued by regional bodies).

3.10. The consolidated report (decision) is turned over by the Administration for Organization of Expert Examination on Safety of Russian Gosatomnadzor (district administration of Russian Gosatomnadzor, for permits issued by regional bodies) to the sectorial administration (regional body of Russian Gosatomnadzor, carrying out oversight of safety of the corresponding nuclear- and/or radiation-hazardous objects (products) and production facilities (technology), for permits issued by regional bodies) and the declarant.

3.11. The consolidated report (decision) is considered as accepted, if in the course of 30 days after its receipt, the sectorial administration (regional body of Russian Gosatomnadzor, carrying out oversight of safety for the corresponding nuclear- and/or radiation-hazardous objects (products) and production facilities (technology), for permits issued by regional bodies) lodges no claims.

3.12. Complaints to bodies of Russian Gosatomnadzor participating in organizing and carrying out the expert examination are presented by the declarant or expert enterprise to the Chairman of Russian Gosatomnadzor.

Russian Gosatomnadzor announces the results of the consideration of the complaint no later than 20 days from the date of its receipt.

The decision of Russian Gosatomnadzor on the results of considering the claims can be appealed in accordance with legal procedure.

Presenting a complaint to the court does not suspend the force of the Russian Gosatomnadzor decision.

[Box, p 5]

ORDER

No. 41, 7 April 1994, Moscow

On approval of the Statute on Organizing and Carrying Out Expert Examinations of Planning and Other Materials and Documents Substantiating the Safety of Nuclear- and Radiation-Hazardous Objects (Products) and Production Facilities (Technology)

I ORDER:

Approval of the accompanying Statute on Organizing and Carrying Out Expert Examination of Planning and Other Materials and Documents Substantiating the Safety of Nuclear- and Radiation-Hazardous Objects (Products) and Production Facilities (Technology) (RD-03-13-94).

[Signed] Yu.G. Vishnevskiy, chairman of Russian Gosatomnadzor [end of box]

Requirements Expected

944E0778B Moscow ROSSIYSKIYE VESTI in Russian 27 Apr 94 p 5

[Appendix to Statute on Organizing and Carrying Out Expert Examination of Planning and Other Materials and Documents Substantiating the Safety of Nuclear- and Radiation-Hazardous Objects (Products) and Production Facilities (Technology): "Requirements for Expert Decision"]

[Text]

1. General Requirements

1.1. The expert decision should be objective, conclusive and well-argued. Analysis of the substantiating documents, conclusions and comments should be accompanied by references to specific requirements for the normative documents or to other scientific-technical materials.

1.2. As a rule, all the components of each substantiating document (chapters, sections, clauses, individual paragraphs) are analyzed. Their numbers must be indicated in the text of the decision (for a paragraph—location on the page).

1.3. If there are points in the substantiating documents on which the expert cannot give a competent evaluation, the appropriate recommendations for their expert examination by other specialists should be entered in the expert decision.

1.4. The expert decision should contain the following obligatory sections:

—tasks of the expert examination;

—criteria adopted for the evaluation;

—expert evaluations;

—conclusions and recommendations.

2. Requirements for the Section "Tasks of the Expert Examination"

The tasks of the expert examination should be set forth in accordance with the requirements of the assignment, as applied to the composition and structure of the documents under consideration.

3. Requirements for the Contents of the Section "Criteria Adopted for the Evaluation"

The adequacy of the criteria, norms, rules, methodologies, programs, instructions and other normative-technical documents (NTD) on the safety of the stated activity used (adopted) by the declarant should be evaluated.

If the expert agrees on the scope of the list submitted, he should confirm, in this section of the decision, that he will analyze the materials using the corresponding criteria of the NTD of this list.

If the expert does not agree with the scope of the list in this section of the decision, he must indicate additional NTD, in accordance with the demands of which the expert examination will be carried out.

If, in the opinion of an expert, certain norms applicable to the system (element) under consideration are lacking in the list of NTD on safety of Russian Gosatomnadzor, then in order to fulfill the task of the expert examination, other documents may be drawn in: general industrial NTD, foreign NTD (IAEA [International Atomic Energy Agency]) and other published scientific-technical materials, the use of which should be substantiated by the expert.

4. Requirements for the Content of the Section, "Expert Evaluations"

4.1. The section, "Expert Evaluations," should as a rule contain unambiguous answers to the following questions.

4.1.1. Does the expert feel that:

—the designation of the section (subsection) was correctly chosen;

—there are indications of the stage of development of the object (product) or production facility (technology) under consideration;

—there is an adequate list of reference documents;

—the terminology corresponds to the terminology accepted in domestic NTD.

If information is lacking or is not complete enough, or non-standard terms and designations are used, comments should be made, and moreover, on the terms and designations—with allusions to the NTD.

4.1.2. Does the information presented correspond to the requirements of the specific points of the NTD, the force of which extends to the object (product) or production facility (technology) under consideration.

4.1.3. Does the expert feel that the chapter (section) contains suitable descriptive information with respect to its full reflection of:

—the structural and technological peculiarities of the object (product), production facility (technology) and systems and elements important for safety;

—work under normal operating conditions, and with disruption of the conditions for normal operation, emergency situations, planning and project emergencies;

—interaction and inter-influence under all the above conditions;

—spatial arrangement;

—degree of substantiation of information presented.

4.1.4. Do the adequacy, amount of information and quality of executing the graphic information presented suit the expert.

4.1.5. Has the nuclear- and/or radiation-hazardous object (product), technology (production facilities) under consideration been classified for safety, seismic- and fire-resistance, etc. (if this classification is stipulated by the NTD), and is it presented to the expert fully and correctly.

4.1.6. Is there information on the control and monitoring systems and other systems (ventilation, communications, etc.) involved in the functioning of the nuclear- and/or radiation-hazardous object (product) and production facility (technology) under consideration, and does it meet the requirements of the corresponding NTD.

4.1.7. Is the substantiation of the choice of materials, technological qualities, monitoring- and repair capacity made adequately and fully in the chapters (section) under consideration, and does it meet the requirements of the corresponding NTD.

4.1.8. Are the problems of radiation protection of the personnel and population, as applied to the nuclear- and/or radiation-hazardous object (product) and production facility (technology), adequately and fully substantiated under all work conditions, including a disruption in the conditions for normal operation, and planning and design emergencies.

4.1.9. Have the problems of ensuring high quality been taken into consideration in the material presented, and does the information meet the requirements of the corresponding NTD.

4.2. An approach analogous with that described above should be observed with respect to information:

—on running-in;

—on monitoring and testing when operating;

—on reliability analysis;

—on the limits and conditions of operation;

—on removing from operation;

—on the list of initial events and analysis of accidents, and moreover here the expert should evaluate the declarant's approach to determining the list of repair procedures for normal operation, disruptions in the conditions for normal operation, emergency situations, planning accidents, project accidents; break-down of the list into groups by type of accident; selection from the group of the accidents with the most serious consequences, for their subsequent analysis.

When the expert does not agree with the approaches to analysis proposed by the declarant, a different scheme for analysis of the above-listed conditions should if possible be recommended in the expert decision.

4.3. The expert should evaluate the level of the calculation and experimental substantiations of the information on safety:

—the presence of information on all calculations made;

—sufficient and full volume of calculations made, the degree of consideration of all factors affecting the results of the calculation;

—the presence of data sufficient to make an expert calculation (calculation system, assumptions, initial data, results, their interpretation, conclusions);

—the expediency of carrying out expert calculation; if it is impossible for this expert to make it, it is desirable that a recommendation be made on the organization, enterprise or expert able to perform this expert calculation;

—the presence of information on all the calculation programs used and their certification or verification;

—the volume and adequacy of describing the programs for an understanding and evaluation of their acceptability;

—the presence of information on experiments made, particularly on nuclear- and radiation-hazardous

objects (products) and production facilities (technology) which contain new technical approaches, as compared with those formerly used;

—the adequacy of the experimental base used;

—the volume and adequacy of the description of the experiments for understanding and evaluation;

—the presence of substantiations of the scale of the experimental devices and the suitability of other assumptions and restrictions used in the experiment, in relation to actual work conditions.

5. Requirements for the Content of the Section, "Conclusions and Recommendations"

In the section, "Conclusions and Recommendations," on the basis of the comments formulated in the preceding part of the decision, the expert should draw conclusions as to the degree to which the material under consideration meets the requirements of the NTD on safety.

The following proposals may serve as recommendations to eliminate existing shortcomings and bring the object to the required safety level:

—information in addition to the existing volume;

—the need to perform additional calculations, calculation analyses and experimental research;

—making additional analyses of the development and course of accidents.

If, in the opinion of the expert, the material under consideration satisfies the requirements of NTD, and an expert examination is carried out to determine the possibility of issuing a provisional or special permit for the type of activity overseen by Russian Gosatomnadzor, the expert must formulate his recommendations for maintaining the conditions for issuing the permit.

6. Requirements for Legalizing the Expert Decision

6.1. The description of the expert decision indicates a full designation of the substantiating document. The last name and initials of the experts should be indicated after the designation.

6.2. The expert decision is presented in the form of a typewritten text, verified by the stamp of the expert enterprise, in the number of copies indicated in the assignment for carrying out the expert examination, and on a 5.25-inch floppy disk (diskette).

The diskettes should be formatted for 360 kilobytes. The files on the diskette should be compatible with the LEXICON editor routine.

The format of the file pages: number of lines per page—40-43, left-hand margin—8 spaces, length of line—70 spaces, paragraph indentation—13 spaces.

6.3. The typed text should be signed by all the experts carrying out the expert examination of the corresponding document.

[Signed] Russian Gosatomnadzor
Registered by Scientific-Technical Administration of Russian Gosatomnadzor
11 April 1994
Registration No. 100-94

Ukraine Establishes Laser Technology Research Institute

947A0042B Kiev PRAVDA UKRAINY in Russian 5 Apr 94 p 2

[Conversation between Yelena Svetova and Vladimir Sergeyevich Kovalenko, academician, New York Academy of Sciences, professor, Kiev Polytechnic Institute (KPI), director, Institute of Laser Equipment and Technology, interspersed with commentary: "Just Born and Already Universely Known. So They Say of the New Laser Equipment and Technology Institute Recently Appearing on the Scientific Map of the Ukraine"; the first four paragraphs are an introduction]

[Text] In actuality, scientists already long ago called this department of the university in the capital an "institute." Indeed, it was difficult for them to visualize that the personnel of the laser technologies laboratory of the KPI were by themselves capable of reaching the world level of development work and that the results of its activity would draw the closest attention in many countries.

And indeed, the former laboratory director, now the director of the new institute, professor Vladimir Kovalenko, is acknowledged to be one of the world's leading specialists in the modern technologies field. Accordingly, he was one of the first in the former USSR to be elected an academician of the New York Academy of Sciences and has become a member of the most prestigious international organizations of laser specialists, the coauthor and coeditor of many ultramodern scientific publications and catalogues.

The new scientific research institute is a structural subdivision of the Kiev Polytechnic Institute, intended to bring together the efforts of scientists at the university and many research institutes for solving problems in the scientific branch. This will assist considerably in regeneration of the Ukrainian economy.

At the KPI research in the field of laser equipment and technology has already been in progress for more than 30 years. The university laboratory, headed by Professor Kovalenko, has been transformed into a singular interbranch instructional, methodological and scientific center. His students have proposed to practical workers more than a few new methods for large-scale working of objects from metal, their hardening and local alloying, using laser radiation. Control points have been established at many enterprises where KPI representatives are helping to introduce modern technological processes.

"Many feel that the establishment of new scientific institutes at the height of a very serious crisis is Utopian. After all, you are in no position to receive the most necessary material resources. How do you dare take the risk?" I say in addressing the director.

"On the other hand, we have a primary resource—intellectual," responds Vladimir Sergeyevich Kovalenko. "Only several years ago the former USSR accounted for

more than 32% of the world's engineers and scientists, with the Ukraine accounting for about 7%. This is an enormous potential on which our young country rests its hopes. With respect to the technologies which we have developed, it is precisely they which it is desirable be used extensively in our complex times. They are easily applied in small shops and laboratories and in commercial service facilities where they can be used successfully in cutting, joining and marking metals and other materials and filling a great many other orders. And saturate the market with products produced without gigantic production sites and unwieldy equipment.

Why are many academic institutes on the rocks? They are in the stage of introduction of innovations into industry for organizing new experimental lines of production (when considerable sums have still not been earned) and have no relatively inexpensive work force. We, adhering to the experience of the leading, well-developed countries, intend to rely on young people, students, who have energy, enthusiasm, assertiveness and ambition. They have their entire lives before them and therefore they do not fear to take a risk.

And still another circumstance. I became aware of it during my foreign trips, especially the last, when over the course of several months I lectured at one of the largest universities in the United States, located at the center of the state of Ohio."

"I see here: in the documents which the Americans gave you were called a 'Distinguished Visiting Professor'..."

"It appears that they have such an official title. But let me finish my thought. Abroad they regard our work with extreme respect, they intend to cooperate with us, carry out joint research experiments and exchange students. And representatives of the Ukrainian diaspora are even interested in having their children receive a higher education in the Ukraine. This will mean additional income for the KPI."

The cessation of the activity of the Council for Mutual Economic Assistance (SEV) and the disappearance from the map of such a country as the GDR for only a short time stopped the scientific and creative contacts between the two largest universities in Europe—Kiev Polytechnic Institute and the "Friedrich Schiller" University at Jena. Now it is not ideological compatibility, but the significance of the research conducted at the KPI which has again attracted the attention of German scientists and has forced renewal of the joint work on developing new laser technologies and diagnostic systems which was interrupted for a year (this work was carried out earlier within the framework of the Complex Program of the Member Countries of the SEV, intended to run to the year 2000).

"As a result of cessation of SEV activity, the funding of our joint work also ceased," continues Professor Kovalenko.

"For some time we knew nothing about the future fate of our joint research. But then a letter was received from Germany in which they proposed a new program to run until 1995. It is ensured funding by the Association of Rectors of German Universities and makes provision for activation of the exchange of specialists and intensification of scientific research in the field of laser technologies and equipment."

For a long time Professor Kovalenko presented lectures to students and specialists in China, Japan and many other countries, also including countries of the former socialist camp, with which mutually advantageous agreements also have been concluded.

The distant island of Taiwan, with which the Ukraine has no diplomatic relations and where we have no trade or cultural representatives, opened its formerly tightly sealed doors to the scientists of the Ukraine. The first among them to be invited was Vladimir Kovalenko. Over the course of three weeks he presented lectures and consulted with Taiwanese colleagues on new technologies. The principal organizer and sponsor of the visit of Vladimir Sergeyevich to the island was the general director of one of the largest international companies in the world engaged in the fabrication and application of computer systems, which is located there. It specializes in deliveries of very complex equipment to the countries of East Europe.

"Recent events have made possible a new look at the problem of using the latest advances in science and technology in different economic branches," says the scientist in ending our conservation. "We can and must develop fundamentally new aspects of increase in the quality of production, find many-sided approaches to the introduction of highly efficient technologies under conditions of a developing market. The former mechanisms of innovative processes are hopelessly outdated.

Despite the crisis we have succeeded in acquiring a solid material base: laser apparatus, computers and other equipment. The Laser Technology Center, which includes the new institute and the department at the KPI, will provide strong encouragement for the development of a high-priority field and will enable Ukrainian scientists rightfully to enter the world laser community."

Russian Duma Recommendations for Increasing State S&T Budget

947A0043A Moscow POISK in Russian
No. 15 (257), 15-21 Apr 94 p 1

[Unsigned article: "Arguments and Figures"]

[Text] In the last number we reported that the Science Subcommittee on Education, Culture and Science of the State Duma tabled the draft budget proposed by the government with respect to the part relating to appropriations for science. It was proposed that it be returned to the government for a radical reworking. What induced the subcommittee (one of whose concerns, incidentally, is the revision of the budget for the purpose of reduction of government expenditures) to take such a decisive step? We bring to your attention the arguments of the subcommittee experts set forth in their conclusions concerning the draft law of the Russian Federation entitled "On the Federal Budget for 1994" in the section "Fundamental Research and Facilitation of Scientific and Technical Progress."

"The amount of funding of fundamental and applied science provided for in the draft budget is catastrophically

inadequate. In comparison with 1991, when the fraction allocated for science was 1.03% of the GNP, the expenditures on scientific research in comparable prices have been reduced by half.

The calculations serving as a basis for the presented budget depart from the practices which took shape during the preceding years, solidify and intensify the pernicious tendencies, make no provision for structural changes and principles of budgetary policy have not been laid which would facilitate the necessary restructuring of the organization of scientific research.

The proposed draft budget retains the deformed structure of expenditures on science which has taken shape during recent years when the fraction of sums for the payment of labor and social security has added up to more than 81/

. The indicated structure completely ignores the sharp, by a factor of 30-50, increase in prices for fuel and electric power, the significant rise in prices for transportation and communal services, expenditures on scientific equipment, materials, reagents and scientific information. Thereby this ensures only the maintenance, and extremely inadequate at that, of part of the scientific personnel, without the possibility of conducting scientific research itself.

"The sum of proposed expenditures for science in the amount of 11.8 trillion rubles, figuring in the composite balance, should not lead one astray because ⅔ of this sum is an unbudgeted fund for scientific research, development, testing and engineering work, allocations to which are not of a mandatory character and therefore under economic crisis conditions are unrealistic (in 1993 of the predicted 1.7 trillion rubles of unbudgeted sums for scientific research, development, testing and engineering work in actuality only 41.6 billion were actually received). Thus, in actuality, one should count only on the budgeted component—4.5 billion rubles (0.6% of the GNP).

The presented draft budget strengthens the residual principle of funding of the scientific sphere because it is funded from the development budget, whose formation, in accordance with the law "On the Budget System of the Russian Federation," can be carried out only in the absence of a budget deficit, but such a deficit is embodied in the presented draft. Thus, science has virtually no guarantees of funding.

In the opinion of the subcommittee, the expenditures for civilian science included directly in the federal budget for 1994 in Article 15, Section 4, should not be 4.5 trillion rubles, but not less than 7.7 trillion rubles (1% of the GNP and 4.2% of all the budgeted expenditures, which is half less the fraction of the GNP allocated for science in the well-developed countries and is acceptable only if there are substantial tax, tariff and customs privileges), of which not less than 2.8 trillion rubles must be directed to material expenditures, purchase of scientific publications, ensuring a modern level of informational servicing of scientists, as well as compensation for the expenditures on energy for the maintenance of scientific institutions and covering the expenditures on energy by scientific projects having high energy requirements. Thus, the minimum expenditures on science require the additional allocation of 3.2 trillion rubles.

Even these sums will make it possible to cover the needs of only a part of the scientific research and therefore at the same time it is necessary to make provision for an increase in the direct funding of projects and programs, specifically directed support of scientific schools and groups, as well as individual researchers. The fraction of the budgeted sums (including the monies subject to distribution through funds, ensuring the implementation of a selective scientific and technical policy, must be not less than 45% of the total expenditures on science.

In this case it will become possible to direct to the funding of fundamental science, which is a national cultural treasure and which which will provide the premises for economic rebirth of the country, about 2.5 trillion rubles (0.35% of the GNP, which corresponds to the structure of expenditures for these purposes in the well-developed countries). It must be emphasized that the funding of fundamental science throughout the world is virtually completely assumed by the state."

The conclusion that there is a need for allocating additional sums was supported by the participants at a conference of the subcommittee which was attended by representatives of the Russian Academy of Sciences, Russian Academy of Agricultural Sciences, Russian Academy of Education, Russian Academy of the Arts, Russian Academy of Architecture and Construction Sciences, Russian Engineering Academy, Academy of Technological Sciences, Academy of Natural Sciences, Moscow State University, Council of Rectors of Moscow Colleges and Universities, State Archives, State Committee for Higher and Intermediate Education and Russian Ministry of Science and Technical Policy.

State Duma Committee Chairman on Problems With Research Funding

947A0043B Moscow PRAVDA in Russian 15 Apr 94 p 2

[Interview of V. Shevelukha, academician, Russian Academy of Agricultural Sciences, by Viktor Trushkov, PRAVDA correspondent, "Science Suffers From Starvation"; the first paragraph is an introduction, the last paragraph is a postscript]

[Text] V. Shevelukha, academician, Russian Academy of Agricultural Sciences, deputy chairman of the Committee on Education, Culture and Science of the Russian Federation Duma, answers questions from a PRAVDA correspondent, Viktor Trushkov.

Trushkov: Viktor Stepanovich, permit me to congratulate you: insofar as I recall, for the first time in the history of Russian legislative authority the parliament has included in its agenda a special law on science.

Shevelukha: Not simply on science, but also on the critical situation in science. It is true that such an approach did not sit well with some deputies.

Until now there have been no programs for the reorganization of scientific research in our country. Accordingly, the Committee on Education, Culture and Science of the State Duma decided to draw the attention of the Duma, government leaders, ministries and departments to this vitally important problem.

In world and former national practice 60-67% of all the appropriations for science were spent on fundamental research, 25-30% went to applied research and 8-10% went to technical and other development work. Such an infrastructure of expenditures on science has been the case for many years in the United States and other well-developed countries. So it also was both in the USSR and in Russia up to 1990 inclusive. Now everything is different. First slowly, and then at an accelerated rate, the government of Russia began to reduce the amounts of budgeted funding for science and by late 1993 had reduced it to 0.7% of the GNP. The financial bind in science first of all affected salaries of scientists. In late 1993 they received from 30 to 70 thousand rubles per month, which is two or three times less than the average wage of all categories of workers in the country. The payment of even this miserly wage is constantly in arrears at many institutes and institutions of higher and intermediate education.

Trushkov: Is it not fundamental science which has suffered most severely? There is no real market for its product.

Shevelukha: To be sure. Here development work cannot be turned immediately into a product which would make it possible to obtain additional sums for the funding of science. As a result, there has been a rapid curtailment of research in the fields of mathematics, physics, electronics, information science, theoretical biology and the most important branches of the humanities. Highly qualified scientists are leaving the laboratories and institutes for other spheres of activity and are going abroad.

Becoming convinced of the growing catastrophe, the Ministry of Science and Technical Policy has attempted to bring about additional injections of funds. A fund for fundamental research was established. But its resources are negligible: 3% of all expenditures on science. It was clear that this was not enough. Then the government decided to "rescue" science in another way: designate science centers for the most important priorities in fundamental and applied sciences, based on already existing institutes. But this also will scarcely do the job.

First of all, where is the guarantee that a proper choice will be made of the future priorities in the field of fundamental research? The entire history of world science gives evidence that such priorities arise in the course of the internal logic of development of science itself, not on the basis of the prevision of government officials. And second, the organization of so-called science centers in accordance with the "latest" concepts of the Ministry of Science and Technical Policy will inevitably result in the elimination of the solid front of fundamental research making up the optimum infrastructure of science, and also to the shifting of the greater part of expenditures from the sphere of the fundamental sciences into the field of technological development work.

Trushkov: Recently foreign sponsors have appeared in Russian science. Their assistance is widely heralded. And what is the effect?

Shevelukha: In actual practice this assistance for the time being for the most part has a propagandistic character and is being made available in inadequate, symbolic amounts. But it is accompanied, as a rule, by the collection of highly important information on the principal research directions, on scientific priorities, on the structure and attainments of Russian science.

Judge for yourself. Russian scientists each receive $500 in one small grant (donative sum for a high-priority purposeful project) from the International Soros Fund. Three years in a row the World Bank has promised to render assistance to Russian agrarian science. Many private proposals arrive from abroad for our scientists asking that they carry out special-order priority tasks in Russian or foreign laboratories, with their results being sent abroad. But, indeed, it is well known that almost all those who are rendering assistance to Russian science are pursuing the objective of adapting and using the powerful scientific and technical potential of Russia in the interests of their own countries. "echelon of science"—in technological research?

Shevelukha: There also the conditions are pitiful. I will cite an example from a sphere close to me. Due to the reduction in state support there is a sharp decline in research not only in theoretical biology, but also in bioengineering. Laboratories are closing and specialists are departing for abroad.

But it is precisely by modern bioengineering methods that in the next few years throughout the entire world there will be a qualitative improvement in plants, animals and microorganisms used in medicine, agriculture and in the processing and food industry.

Unfortunately, none of this is being taken into account by the leaders of the country. Meanwhile, in the United States, in the European countries, in Japan, and during recent years also in China, India, Vietnam and in many countries of Africa and Latin America national bioengineering programs are being developed and applied. But we made the first breakthrough.

Trushkov: The picture which you have drawn is a joyless one. The experience of Soviet science, if it is not being slighted, is being cast aside. But there is still world experience. Two different approaches to the choice of a state scientific and technical policy are known. First, the "American" variant, in which there is assurance of a broad front of fundamental research carried out by budgeted and other financial sources in the United States. The research results are used both for national needs and for the world market. Second, the "Japanese" variant, in which most of the new technologies are based on the purchase of patents from abroad and on their basis the latest national industry is organized. The high competitiveness in production makes up for the cost of acquiring patents and makes it possible to create their own scientific potential. Which of these routes is more acceptable for Russia?

Shevelukha: Neither one of them is suitable in its pure form. We need our own way in the development of science and industrial technologies. And, in particular, under the present-day conditions. It essentially involves our own research in priority fields. This is much cheaper than the purchase of patents. Only in this case is it possible to ensure a gradual reduction in the volumes of importation of the latest technologies and the creation of our own competitive production of products with a high scientific

input for our country and for sale on the world market. Precisely for this reason it is entirely inadmissible that there be a sharp reduction in space programs because there is an ongoing precipitous narrowing of the possibilities for producing the latest technologies in almost all economic branches.

Trushkov: But not being concerned about the future, may political favorites not put the focus on applied research?

Shevelukha: The reduction of budgeted funding has undermined the basis for the successful development of many priority aspects of applied research. As an example, I will once again cite a sphere which is close to me. The importance of plant selection and animal breeding is obvious to all; it exerts an enormous influence on the solution of acute agrarian and economic problems in the country as a whole. Precisely in these fields of applied science in the not distant past Russian scientists attained outstanding results which received world recognition. The genofund of varieties and hybrids of plants, animals and birds which they formed served as a basis for major achievements in plant selection and animal breeding in many countries. If today the good results of selection still persist in Russia it is due only to the enthusiasm of scientists of the older and middle generations. Despite the wretched wages, the lack of attention to it on the part of the state, they continue to manifest scientific zeal. During 1993 345 new varieties and hybrids of agricultural plants were developed and 182 were regionalized. More than 4000 varieties and hybrids have been developed and regionalized in Russia. This represents enormous national wealth. But the enthusiasm of selection specialists will soon dry up and the agrarian sector of the economy will have to rely on the old store of varieties and breeds. However, even that paultry economic support to selection science which was provided for by the Law on Selection Attainments, adopted in 1993 and signed by V. N. Yeltsin, unfortunately is not being delivered. The Finance Ministry and the Economics Ministry still refuse to carry out the economic measures for supporting selection work provided for in the law. Meanwhile the level of budgeted funding for selection work in the country is already less than 30% of the needs.

Trushkov: But is it possible that applied science will begin to flourish with a changeover to a market economy? Possibly the scientists in this sphere, whose "democrats" are accused of inability to master market mechanisms, are responsible.

Shevelukha: To be sure, under conditions of entry into the market scientists working in the applied science sphere must learn to advertise and market their scientific products. And this also applies to research of a technological nature in all scientific fields.

But try to visualize a situation in which a talented scientist is forced to use more than half his time allocated for scientific research in seeking a buyer and sale of his product. This is a squandering of the national wealth. A scientist should be engaged in research work. Now many branch scientific research institutes are seeking different self- funding methods. The institutes and experimental stations of the Russian Academy of Agricultural Sciences, for example, cover almost of the expenditures in their activity by the sale of seeds, breeding cattle and vaccines by contracting for the introduction of scientific advances and by other kinds of commercial activity. But in this case scientists are burdened by work which is not really their own and there is a decrease in the efficiency of scientific research.

Conclusion No. 1—more than half the expenditures on applied research must be covered by the state budget. For covering the second half of the expenditures it would be possible to enlist commercial organizations engaged in the sale of scientific products. But government agencies should be concerned about such a dual source of organization and funding of science.

Trushkov: Is there hope that the State Duma will assist in the survival of Russian science?

Shevelukha: I think that it will. The adoption of reasonable laws favoring a rebirth rather than the suffocating of science is the primary intent of the parliament.

Postscript—The State Duma has adopted a decree entitled "On the Critical Situation in Russian Science." In this decree it is proposed that the government examine the problem of ensuring the preservation and further development of the scientific potential of the country on the basis of priority funding of fundamental and promising practical research, establishing a commission for developing mechanisms for the funding of science, working out a program of state support for the entry of national scientific and development work into the world market, setting up a fund for the funding of expenditures on the patenting of scientific attainments abroad and formulating a program of measures for preserving the personnel base of science.

The Duma spoke out for the granting of tax privileges to scientific, planning, design and educational institutions. It considers it to be inadmissible that monies for the funding of higher education be transferred to subjects of the Russian Federation and requires that in 1994 institutions of higher and intermediate education be funded from the federal budget.

Russian-European Scientific Cooperation Program Described

947A0048A Moscow USPEKHI FIZICHESKIKH NAUK in English No. 2, Feb 94 p 238

[Text]

Announcement on INTAS Research Grants for 1993—509 Projects of Scientific Cooperation With the Former Soviet Union Launched

—At its General Assembly meeting on 21st December 1993, the INTAS Association (International Association for the Promotion of Cooperation with Scientists from the Independent States of the Former Soviet Union), set up at the initiative of the European Commission, has adopted 509 cooperation projects between laboratories in West Europe and in the Former Soviet Union (FSU). The total contribution made by the INTAS Association to these projects amounts to 21 million ECU.

—"With this portfolio of projects, declared Prof. Antonio, Commissioner in charge of research at the European Commission, the INTAS Association constitutes one of the major actors and key elements in scientific cooperation between Western Europe and the former Soviet Union republics".

—Each project associates a minimum of two laboratories in Western European countries and one in a FSU country. In total, 1214 FSU laboratories and 1754 of the INTAS member States laboratories are involved in the action.

—Covering a wide spectrum of disciplines in exact and natural sciences (physics, astrophysics, mathematics, chemistry, life sciences, Earth sciences, environment); applied sciences and technologies (engineering sciences, aeronautics, space, etc.) and social, economic and human sciences, these projects represent frontier research and are based on cooperation with mutual benefit. Involvement in these joint activities will permit research teams of the New Independent States to stay in their laboratories and get to continue their work at an international level.

—The funds awarded by INTAS to the FSU laboratories are essentially to cover the renumeration of their scientists; the funds directed to the Western European laboratories will cover project coordination costs.

—The 509 projects are the result of a call for submission of research proposals launched just after the setting up of INTAS and with the deadline of 15 October 1993. The large number of proposals received were evaluated by the Council of Scientists of the Association, which consists of eminent scientists from the European Union and the New Independent States.

—These projects represent a second wave of projects launched by INTAS. A first wave of 54 projects were launched in June 1993 for a total amount of 4 million ECU.

—New INTAS Association activities are foreseen for 1994 and should be announced in the beginning of this year.

—INTAS Association groups the European Union, its twelve Member States, Austria, Finland, Switzerland and all of the independent states of the former Soviet Union (Armenia, Azerbaidjan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldovia, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan). It was officially set up on 29 June 1993 by the first meeting of its General Assembly.

Additional Information

Secretariat of INTAS Association

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Akademgorodok Sees Dramatic Increase in Crime Rates

947A0051A Moscow DELOVOY MIR in Russian 19 Apr 94 p 4

[Article by Yuriy Tokarenko, DELOVOY MIR: "It is Better to be Clever and Rich... What is the Future of the Novosibirsk Akademgorodok: Intellectual Base of Civilized Entrepreneurship or the 'Brain Center' of Criminal Syndicates?..."]

[Text] ...Surely for the first time the poet Andrey Voznesenskiy, spoiled by "sold out" notices, was faced with a hard fact: the public might not be coming to hear him. Not in this present-day Akademgorodok, the once freedom-loving child of the "thaw." Some have departed for the West by permanent contract"; the capital of our impoverished science has "cleansed itself" of others, those seeking the sole possibility for keeping themselves afloat: sell their apartment and acquire a modest corner beyond the limits of this prestigious region which is more in keeping with their salary. The once elite law-abiding Akademgorodok is today the second in the rate of increase in crime among the nine rayons of Novosibirsk with its population of 1.5 million.

The prediction, fortunately, did not prove to be justified. There were no empty seats in the hall of the House of Scientists. But the poet, not closing his eyes the entire night prior to his impending appearance, evidently himself sensed something, on the eve of his appearance writing in the plane:

Precious is the time when I visited Akademgorodok. After the passage of time I fly again in returning to the East.

Suddenly you are no more? And to what will I arrive—Into the academic darkness or into the academic light?

I am drawn to this little city, I do not understand why. Or am I a paradox—free in captivity?

Alas, there are more than enough paradoxes to go around. In a society in many respects ready for changes, caught up by the dogmas of a numbed and hypocritical system (it has been nicknamed "demgorodok"), the habitat of intellectuals, of those in their sixties, today has literally been taken over by the criminal world, controlling the "market" in accordance with their criminal concepts.

During the incomplete last year there was a 48.7% increase in criminal activity; for heinous crimes, by 73.2%, for gang crimes, by 49.4%. The number of newly registered persons here has almost twice exceeded the number of displaced former residents of Akademgorodok (in other rayons these shifts were approximately equal).

Who are they who have "closed in" on the still not departing academicians and corresponding members? Data from the information center of the Novosibirsk Oblast police department also give an answer to this question: persons arriving with a checkered background of criminal code violations. Those who earlier already have committed crimes have here increased in numbers by an amazing 1550%.

And with them the very mentality of Akademgorodok also is gradually changing. Its world status is being degraded to a flea market with all the same petty hawkers, conducting their trade in lop-sided competitions with displays of the programs of international symposia. The cafe "Pod integral" ["Under the Integral"], famed for its "suspect" friendly evenings at the time of the "flourishing of stagnation," has disappeared. The restaurants, where once at the tables discussions were continued by the leading lights of science, coming here from throughout the world, now also have other owners, including racketeers and "easy girls." And this was demonstrated by the clientele, mercilessly assaulting a recently respected academician who had been so bold as to dine at the "Yermak"...

How did it happen that the scientists who both Cambridge and Oxford Universities have awarded the titles "Man of the Year" and "Man of the Century" have been forced to look each new day in the eye, bearing ever-increasing lack of assurance in life under the realities of the market? How is it that those who feed world science ideas (according to data of Western experts, together with Moscow scientists Novosibirsk scientists hold first place with respect to the number of citations to their studies) at times are basically unable to support their families?

As is well known, Professor Bormental from the novel "A Dog's Heart" by Bulgakov, tried to humanize Sharikov. But he himself became his victim. Not finding its place in the changing coordinates of time and social conditions, the capital of Siberian science has granted to each of its inhabitants the "freedom" to solve the market problem "in their individual way." To put it more simply, to seek ways to survive. And become a victim not only of the chaos, but also of the clearly defined dangerous tendencies.

Here is the prediction of T. Galkina, a specialist of the Novosibirsk Russkoye Zarubezhye Humanitarian Center.

"It would be the height of naivete to assume that the 'brains' not used by the state have escaped the attention of the criminal gangs. The 'conveyor of ideas,' which could create original industrial technologies, will be in the service of the criminal world. The external factors responsible for the burst of criminal activity (struggle of Western companies for the Siberian market, foreign exchange transactions, geopolitical situation, etc.) and the internal crisis, driving enormous masses of people to the brink of poverty, proved to be closely intertwined in Siberia. Novosibirsk, having a powerful industrial, financial and scientific potential, is at the center of formation not only of the traditional criminal elements of the work force, capital and valuable papers, but also, and which is most dangerous, shadowy intellectual elements. The recruiting of personnel for the criminal world will be from academic institutes, branch scientific research institutes, colleges and universities, disbanded design bureaus of industrial enterprises and other subdivisions.

It is most probable that in the very near future the state and power structures will run up against a very clearly expressed intellectualization of criminality in Siberia: that is the conclusion of sociologists. This links up with the warning of workers in public health agencies: Novosibirsk is in danger of becoming the center of drug traffic in the Asian-Pacific Ocean region. It is assumed that the heroin 'picked up' here is in actuality the product of an underground laboratory and the organization of technically complex chemical production did not come about without drawing upon strong brainpower."

"Are both the Siberian Department of the Russian Academy of Sciences and the business people of Siberia, for whom the portrayed prospects are identically dangerous, taking heed of these predictions? Alas, the vectors of their movements in general are pointed in different directions."

"Only recently, at the annual meeting of the Siberian Department, Russian Academy of Sciences, there was a discussion of precisely this subject. Having ascertained that state money will suffice only for a modest salary and the payment for electricity, some speakers were distressed: if only two or three years ago the presidium had decided to offer national and foreign companies rooms for offices, land for construction... Today Akademgorodok would be a Siberian business center, attractive for investments, including for the development of the social infrastructure. Such an idea was advanced in his time by V. Parmon, corresponding member, Russian Academy of Sciences. If only things had been speeded up a little and the AO Sibirskaya Yarmarka [Siberian Fair] had been established, an exhibition center would have been opened for the display of new technologies and products with a high scientific content... And this possibility went out the window. However, the "Fair" has today become the third in Russia (after Moscow and St. Petersburg) international trade center...

Now only 3 of 15 have remained in our laboratory. The laboratory head urged them on and on: you, he says, are the true knights of science. Together, he says, we will 'hold the fort,' not giving in to the market bait. But today I was shaken when I saw him, a doctor of sciences, a professor, sitting in the subway on sacks and selling sugar! Now I myself will probably think that over. Evidently there is no other way out."

This monologue of a specialist of an academic institute, receiving, incidentally, a grant from the Soros Fund, is extremely characteristic. But there are examples boding still more weighty ill consequences, both to the priorities of science and to the economy of the country. Reference is to an "intellectual racket," when specialists, breaking free from real science, establish their own work associations, then using for their own advantage the development work which is the intellectual property of entire scientific teams. These are the fruits of all this same indecisiveness, when the fear of losing "pride" in the end results in its loss at the greatest cost...

Hoping to the last hour that the state would not allow science to wind up in a recumbent position, Academy structures did not seek out possibilities for befittingly adapting to the market. By no means under the slogan "Everything is for sale!" But from a position of partnership, cooperation which could prove advantageous both to science itself and to business. Now, judging from the funding, which is contracting, like shagreen leather, the academicians understood: the state does not need science.

Without question, Academician V. Koptyug, chairman of the Presidium, Siberian Department, Russian Academy of Sciences, was correct in saying: "Sometime society will understand that without science and education there can be no normal state." But it is indeed not precluded that this awareness will arrive only when the Akademgorodok remains in ruins... Possibly it may be realized a little sooner that it already today is capable of serving entrepreneurship? Indeed, this will help in saving both personnel and potential and traditions.

But here is what is the most important. Siberian science is not only real "food" for entrepreneurship, capable, with advantage for the country and people, of developing and introducing sometimes priority development work and projects. The potential of the Akademgorodok institutes could provide a conceptual ideology of a civilized market, a prediction of its development (including in the highly important sphere of use of environmental resources), and set benchmarks for legislative initiative. Optimum approaches to solution of various problems with allowance for the trade and other infrastructure of the region could be suggested.

And how much can be learned from the history of entrepreneurship in Siberia! Indeed, much of that which at times led businessmen of the first generation into a blind alley had already been "invented" by the owners of metallurgical plants and landowners, grain traders and merchant dynasties of the past centuries...

But the market structures for the time being do not exhibit any special push toward such an alliance. However, credit must be given: the "Siberian Merchants Meeting," the "Siberian Fair," and the Interregional Association of Entrepreneurs were not sparing in their organizational expenditures for the scientific conference "Siberian Entrepreneurship: Past, Present, Future." The preparations for it were made by scientists of the History Institute, Siberian Department, Russian Academy of Sciences. But the leading business figures were not in the half-empty hall. The scientists "enlightened themselves." This fact, alas, is not the only one. And they, unfortunately, add to the pessimism of the citizens of Akademgorodok as to the very possibility of bringing science and business closer together.

Others with bitterness cite the example of Irkutsk, where scientists recently, with the support of the RF Ministry of Science and Technical Policy, established Siberia's first Market and Entrepreneurship Institute. It would seem that this scientific subdivision was assigned benevolent tasks: search for and validation of acceptable procedures for the transitional period, study of problems in the regional goods market, collaboration in the development of regional trade balances and research on the prospects for social development of Siberia. And here's what's surprising: the local entrepreneurs not only were not interested in contacts with the specialists, but are actively trying to dislodge the institute from the building legally belonging to it...

The following was heard at the already mentioned annual meeting of the Siberian Department, Russian Academy of Sciences: the only thing which can now save Akademgorodok is income from the development of new technologies by orders from national and foreign firms. Such orders from the oil- and gold-producing branches and the fuel-energy complex also may enable us to do this. With respect to "foreign exchange" contracts, some scientists fear that they may become a scientific appendage of the well-developed countries, may become cheap "brains" for them.

It was really necessary to be clever in order to choose at what price to become rich...

Chernobyl Controversy Arises Over RAS Election

947A0051B Moscow IZVESTIYA in Russian 28 Apr 94 p 5

[Article by Kim Smirnov, IZVESTIYA correspondent: "How Yu. A. Izrael Was Elected an Academician", the first paragraph is an introduction]

[Text] At the last General Meeting of the Russian Academy of Sciences, by 230 votes "yea," 88 votes "nay," with 14 ballot papers deemed to be invalid, Yuriy Antoniyevich Izrael was elected a Russian academician. The election did not go off smoothly. The stumbling block was the behavior of Yu. A. Izrael during the Chernobyl catastrophe. He then headed the USSR State Committee for Hydrometeorology and Environmental Monitoring (Goskomgidromet; Gidromet). Here are several fragments of the stenographic record of the discussion (the shorthand record is incorrect, but the essence of the accusations and the counterarguments is conveyed rather precisely). I know not about the number of new writings by Izrael, nor about his expeditions; I can look that up for myself. I would like to know the number of victims, the number of unfortunate there were due to the Chernobyl catastrophe, and after that, how Izrael concealed the true character of the radiation and the first days when no one visualized what this involved. Approximately how many of these victims were there, surely, at least what was the order of magnitude, the scale of the criminality?"

Academician S. T. Belyayev: "The basis for taking the necessary measures after the Chernobyl accident should have been the numerous data on radiation conditions from different departments. Those data from the Goskomgidromet warrant the highest evaluation. The reliability and trustworthiness of the information collected by it were later checked by various international organizations and intercalibrations were carried out. The yearlong work of the enormous body of specialists of the international project of the International Atomic Energy Agency, which did not find any serious flaws in the data presented by Gidromet, is known to everyone.

Now about the role of Yuriy Antoniyevich himself. He relied only on scientifically dependable information, not giving in to any pressure on the part of the administrative and political agencies, which initially was especially strong.

With respect to the information which was suppressed, that is, what was not published in the newspapers, that is not Izrael's fault. That he insistently required the dissemination of all information to the local agencies which were responsible for all measures carried out on the spot. I

myself was a witness to that. You know that the Chernobyl problem was closely intertwined in all political problems and ambitions, a situation which also is continuing to this time.

Here it was necessary display firmness and persistence based on scientific information and not yield to pressure from any other groups which were whipped up into a frenzy. And from what were there more victims later on: from the mass stress to which an enormous number of people was subjected, or from the specific radiation situation which actually prevailed?

"I think that I can speak of this because I observed Yuriy Antoniyevich during the course of all these events. And after 1986 I was first a deputy of Anatoliy Petrovich [Academician A. P. Aleksandrov—editor's explanation], who headed the Interdepartmental Coordination Council of the Academy of Sciences, responsible for all the scientific problems related to Chernobyl. An enormous number of nonprofessional organizations were involved in all kinds of measurements. And in each case it was necessary to analyze the methodological errors. All this work also was organized by Gidromet: there was a scientific council which examined all the measurements, all the data which were collected by all organizations whatsoever. And such data were never released until the reasons for discrepancies were clarified.

That's all that I want to say: the merits of Yuriy Antoniyevich as an administrator, as a scientist at the time of the Chernobyl accident, were manifested very clearly, as was noted, among others, by many international organizations."

Academician V. L. Maslov: "I asked a specific question: what were the numbers, what was the scale? With respect to whether Izrael was involved in the misinformation, I did not ask that question. I know the answer to it. I also was engaged in the liquidation of the Chernobyl accident.

But I think that everyone saw Izrael on television when he gave the people incorrect radiation information. That the Gidromet did a good job, I know very well; I also know that it gave correct information. I say only that the people were given (and everyone knows this) incorrect information. I saw a videofilm. I saw how the children ran and looked at the fire there, in Chernobyl. I saw a pregnant woman who pushed a small child in a wheelbarrow, rather than in a carriage. But what was of importance to me was: what was the scale?"

Next several of our respected academicians spoke out in defense of Yu. A. Izrael. There was mention of the first press conference on Chernobyl on 5 May 1986 where Shcherbina, citing Izrael, gave low figures on radioactivity. These were precise data, but applying to regions in a 30-km radius from the accident site. However, Shcherbina was silent that the Goskomgidromet also gave precise nuclear power plant figures for Pripyat.

In the opinion of the academicians, Izrael could not then publicly refute the accusations that he concealed information because until May 1989 all precise data on Chernobyl were kept under the strictest secrecy. But at the first opportunity he published his charts, prepared in 1986-1987. The verification commission of the International Atomic Energy Agency confirmed his data. One of the international scientific centers awarded Izrael a gold medal with the inscription: "For Chernobyl." Then he was awarded prizes by the UN and the International Meteorological Organization.

Conclusion: the guilt of the designers, the guilt of the government, three years concealing the true data about Chernobyl, cannot be shifted to Yu. A. Izrael, who from the very first day gave precise data on the scale of the catastrophe.

From the hall: "A question, please, for Yuriy Antoniyevich relative to the discussion which arose. I fully trust those data which were presented here. But I have a question: why then did Yuriy Antoniyevich, at that time knowing that falsified data were being given in contradiction to the information which he gave, not resign from his position?"

Yu. A. Izrael: "No one forced me to present any incorrect data or to falsify them. As proof I can say that Mikhail Sergeyevich (M. S. Gorbachev—editor's explanation) and Gromyko at a Politburo session asked me questions like: what is a 'curie,' what is a 'roentgen per hour'? Do you think that people with such a scientific background can force any particular figures to be given? Such people cannot give such and such a figure, you understand?

All the solid information was given to the leadership—higher and local. Unfortunately, really, the matter of publication widely in the newspapers could not be solved by me, but we supplied objective information. I flew directly through the Belarus and Ukrainian countryside and in those regions which had been subjected to the greatest pollution I personally explained to the people why they had to leave their native villages. Many of them did not want to depart, they even shot back, can you imagine that?

I did not receive and we did not receive even a single professional negative comment with respect to our data.

With respect to the question which was posed last, I must once again assert that my task was to pass on all the data, insofar as they were objective, to those people who had need for them. These were the people who suffered from the pollution and those who made decisions.

We do not have such a book, but in France a book has now been published under the name "The Chernobyl Incident: A War of Rumors." On this question there are so many different, generally inadequately checked rumors which sometimes result in a complete distortion of the physical truth.

I emphasize once again that I am answering and am ready to answer to any commission for the correctness of the cited data, for the fact that our team and I personally did everything for this information to reach the people. And I give my word of honor to all present that my conscience is clear."

It is the business of scientists to argue about the accuracy of scientific data. It is the business of politicians and philosophers to argue about the degree of guilt of an

individual under conditions of absolute state authority. However, there are questions which go beyond these limits. Chernobyl remains painful and troublesome in the conscience of each of us, all the people and the country. And therefore it is too early to consider the doubts expressed at the general meeting to be the last word.

In actuality, what can a specialist do who knows the truth under conditions of total censorship? But today, when the letter of P. L. Kapitsa has been made public, both in defense of the arrested L. D. Landau and against the suffocation of Baykal and against other antihuman deeds of the supreme authority, the question about resigning does not seem rhetorical. Who is a scientist—he is only a supplier of new knowledge or data or a person whose conscience cannot be at peace with respect to what will become of this knowledge, especially if it affects everyone, whether it will be made available to the public or will be turned into a state secret?

We had two principal secrets—military and ecological. And Yuriy Antoniyevich, having available the totality of the precise ecological truth, faced with the impossibility of passing it on to the people, did not protest and did not resign. He beautifully went along with the government in covering up this truth. Moreover, he took upon himself the role of an ecological czar. Without the permission of his department the press was given access to not a single document relative to the alarming state of our environment, facts and figures were mercilessly stricken out so as "not to sow panic among the population."

It is true that in speaking and writing about Chernobyl it is necessary to separate clearly the scientific facts from the phantasmagoria of rumors and wild tales. But indeed the primary source of the wild tales themselves was precisely the concealment of the truth. One of the arguments was: if the truth was told the number of victims—from panic—would be still greater. How clever. In any case until now there has been no direct and honest answer to the question posed by V. P. Maslov: what is the price of concealing the truth when reference is to what is most important: the life and health of man?

Science Ministry Creates Fund to Support Small Businesses

947100524 DELOVOY MIR in Russian 21 Apr 94 p 4

[Article by Yuriy Chirkov, DELOVOY MIR correspondent: "Financial Indulgences for Scientific-Technical Business"]

[Text] In Moscow, a resolution of the government of the Russian Federation—in this case the initiator was the Ministry of Science and Technical Policy—has established a fund for facilitating the development of small forms of enterprises in the scientific-technical sphere. Its task is making financial support available to small business, facilitating the development of the innovative infrastructure: small companies with an emphasis on science—incubators of business, venture enterprises, engineering centers, industrial parks, TOO, companies introducing new scientific products and scientific production companies. Assistance will be received by those having patents, licenses and know-how, those who want to become producers of various specific types of goods production.

The fund is concerned with seeking people capable of putting competitive products into production. It is not enough, let's assume, to propose an apt design for a new type of ball point pen, it also is important to become a real owner of a business, a full-fledged businessman.

The fund is a noncommercial, nonprofit organization, but by no means is philanthropic. The inventors of perpetual motion machines must cough up payment for a preliminary expert evaluation—0.1% of the declared estimated cost of the project. The applicants for financial support undergo a rigorous three-step examination: finalize preparation of the application (presentation of a detailed business plan), undergo an expert evaluation and win out over competitors in a final competition.

For the time being the fund is small: 0.5% of the state appropriations for science, which is approximately 20 billion rubles. If an average of 100-200 million rubles is allocated to one scientific-technical project per year, in this case financial assistance can be received by only 100-200 competitors—winner of grants. Really not many, because, according to some estimates, in order to implement all the scientific and technical ideas accumulating in Russia it would be necessary to spend several trillion rubles!

It is intended that the modesty of the fund budget be compensated for in different ways. First of all, the work is to be conducted in close collaboration with banking capital. Now the conditions for getting money at the bank are severe: 250-280% interest is charged for a loan and the money is usually given not for a year, but only for three months. Inflation! Under such conditions for a goods producer, especially one arriving from science, the chance of surviving—returning the money and getting a profit—becomes virtually equal to zero.

In order to break free from these shackling conditions the fund proposes the following. Let's assume that 150 million rubles are necessary for a business, 50 million are provided by the bank at 300% interest and 100 million are provided by the bank without interest. Thus, after a year a company highly oriented on science should return a total of 200 million rubles to the bank. As we see, the conditions for the loan are extremely advantageous. The newly established company so- to-speak receives a monetary forgiveness of sins—an unusual financial indulgence.

Well, and what are the reciprocal advantages from the fund-bank alliance? There are several of them. The most important thing for the bank is that it receives more than its interest. For the bank, now after the careful preliminary expert evaluations made by the fund, there is a considerable decrease in the probability of subsidizing a future bankruptcy. The fund also comes out ahead. First of all, it schools yesterday's researchers, for the first time setting out on the slippery uneven path of business, to the market, to its severe laws. Second, the fund can employ well-organized banking mechanisms for recovering sums from organizations which either do not live up to the stipulated conditions or are not playing an entirely honest game, for

example, are taking the money for scientific purposes and diverting it for other purposes, trading in consumer's goods.

The fund has a mutually advantageous link other than with banks. Such an organization (Ivan Bortnik, doctor of technical sciences, academician of the Russian Engineering Academy, became its general director) is striving to establish a partnership also with the leaders of regions of the Russian Federation. We saw that the fund does not have that much money. It certainly does not suffice for the whole of Russia. But it is necessary to support all the far reaches of our vast country. The regions must create a system of advantageous conditions, a favorable climate, for innovative activity by their citizens—future goods producers (knock off taxes, not take payment for power, etc.). And at the same time define the range of goods and items for which they have an extreme need. The task of the fund, moreover, is to assist in establishing companies capable of rapid satisfying regional markets with all their needs.

Meanwhile, the fund already has received several hundred interesting applications. The personnel of the fund (they are few in number, only several tens of specialists plus an Observing Council, consisting of seven persons, representatives of the principal ministries and the Russian Academy of Sciences), appointed by the government, are acting efficiently and decisively. The funding of companies, winners of competitive awards, will not be opened every year, but quarterly. And the first funding will begin on 1 July.

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CHEMISTRY

Principles and Theory of Circulating Liquid Chromatography With Two Cycles

947M0060B Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No. 9, Sep 93 (manuscript received 26 Oct 92) pp 1535-1538

[Article by V. P. Chiznkov and N. E. Varivonchik, Organic Chemistry Institute imeni N. D. Zelinskiy, Mowcow; UDC543.544]

[Abstract] Circulating chromatography is a variant of chromatography where the mixture of substances is repeatedly passed through a single column or system of columns. Preparative circulating liquid chromatography, widely used abroad, employs the closed loop principle and is used for separation of substances in quantities ranging from milligrams to several grams of ultra-pure compounds. While multiple recycling of components through a column may separate portions of a mixture, such factors as the dead volume of the circulating pump, the duct work, dosimeters, and connecting joints become major sources of contamination and undesired erosion of the chromatographic band. Circulating two cycle chromatography has been proposed as an alternative to the closed loop principle of chromatography. The two cycle scheme requires no special pumps or other elements. The theory of fine separation of binary mixtures is expanded to include the possibility of programming the length of the sorbent layer and using step-wise chromatography. Theoretical analysis and calculations indicate that two cycle circulating systems with two columns filled with sorbent particles 10-35 microns in diameter provide high resolution separation with low pressure drop between the columns. Figures 3; references 15: 8 Russian, 7 Western.

Study of Mechanism of Membrane Extraction of Cobalt (II) From HCl Solutions Using Solutions of Tri-n-octylamine in Decane by IR-Fourier Spectroscopy

947M0060C Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No. 9, Sep 93 (manuscript received 15 Oct 92) pp 1539-1544

[Article by L. M. Lebedeva, L. M. Kardivarenko, and N. A. Plate, Petrochemical Synthesis Institute imeni A. V. Topchiev, Moscow; Geochemistry and Analytical Chemistry Institute imeni V. I. Vernadskiy, Moscow; UDC543.2- 541.127.333]

[Abstract] Quasi-liquid membranes may be used in place of liquid extraction to concentrate and separate metals. One of the shortcomings of membrane extraction is the low reproducibility of quasi-liquid membranes. This may be overcome by increasing the contact surface of the phases by multiple emulsification or by using a different type of module. However, there are other ways. When metals are passed through an extraction quasi-liquid membrane, maxima are frequently observed on curves representing stream size as a function of the concentration of carrier-extractant. These maxima represent the presence of parallel processes accompanying metal-carrier interaction. Basically, these are solution processes having an effect on the system viscosity when the coefficient of distribution of the metal in the aqueous and organic phases becomes a function of both the carrier and the concentration of the solvent. However, it is entirely possible that a change in the mechanism of the metal transfer takes place within these maxima. In the present work IR- Fourier spectroscopy was used to study the extraction of cobalt (II) from a hydrochloric acid solution with a tri-n-octylamine in decane solution. A marked increase in cobalt (II) transport over a narrow interval of extractant-carrier during membrane extraction is explained as being due to a change in the transport mechanism, hypothetically differing from either a diffusion or "relay" type mechanism. Figures 3; references 22: 8 Russian, 14 Western.

Quantum Chemical Study of Allyl and Vinyl Compounds of Group V Elements

947M0060D Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No. 9, Sep 93 (manuscript received 5 Nov 92) pp 1551-1554

[Article by V. M. Promyslov and P. P. Shorygin, Organic Chemistry Institute imeni N. D. Zelinskiy, Moscow; UDC530.145:32]

[Abstract] Conjugation in allyl and vinyl compounds of heavy elements has been analyzed by quantum chemical methods for a rather broad range of hetero-atoms, particularly compounds of Groups IV and VII elements. The present work focuses on analogous derivatives of Group V elements using semi-empirical quantum chemical MNDO methods for computations with parameters for nitrogen and phosphorus. Long wave electron transition and oscillator energies were calculated for various allyl- and vinylamine and allyl- and vinylphosphine conformers. The electron structures of these molecules were examined in detail and both the spectral and conformational manifestations of n,π- and δ,π-conjugation were analyzed. Several hypotheses are advanced on possible manifestations of conjugation in allyl compounds of arsenic, antimony, and bismuth. Figures 2; references 14: 5 Russian, 9 Western.

Crown Ester-Containing Styryl Dyes. Report 9. Nitropyridinium Salts in Synthesis of Chromogenic Crown Esters of Indolenine Series

947M0060F Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No. 9, Sep 93 (manuscript received 14 Dec 92, after revision 16 Jun 93) pp 1625-1632

[Article by S. P. Gromov, M. V. Fomina, and M. V. Alfimov, Chemical Physics Institute imeni N. N. Semenov, Moscow; UDC541.143]

[Abstract] Photochemically active poly-functional compounds, which may be derived from styryl dyes and contain the crown ester group, and capable of selective complex formation with metal cations, present great interest. Such selective chromogenic crown esters may be used, for example, in the colorimetric determination of cations. Furthermore, the capability of crown ester-containing styryl dyes to change structurally under light makes it possible to consider them as elements in photoswitching molecular devices. In the present work the

synthesis of indole from nitropyridinium salts was improved and a method was developed for the synthesis of quaternary salts of new indolenine derivatives. The resulting indolenine salts condense with formyl derivatives of crown esters to styryl series dyes. Photoisomerization and complex formation of the crown ester-containing dyes with salts of alkali and alkaline earth metals was studied. A correlation was found to exist between the magnitude of spectral shift of the long wave absorption maximum of the dye, and the size and charge density on the metal cation. Figures 3; references 18: 10 Russian, 8 Western.

Volt-Amperometric Determination of Lead and Copper in Effluents of Optical Production

947M0057A Moscow ZAVODSKAYA LABORATORIYA in Russian No. 3, 1994 (manuscript received 5 Mar 93) pp 14-15

[Article by N. A. Ulakhovich, M. A. Al-Gakhri, L. G. Shaydarova, D. G. Khuzyasheva, and G. K. Budnikov, Kazan State University; UDC[546.817+546.56]:543.253]

[Abstract] Oxygen-free glasses containing sulfur, selenium, tellurium, and other heavy metals are used widely in the optical industry and the effluents resulting from production have been analyzed in efforts to develop effective measures for lowering the toxic metal content. Thus the present work recommends determination of Cu(II) and Pb (II) in the presence of other heavy elements using the volt-amperometric technique employing a crown ester (dibenzo-18-crown-6) modified coal-paste electrode. Voltamperograms were recorded on a PU-1 polarograph and a PO- 5122 oscillographic polarograph Model 03. Concentration of Cu(II) and Pb(II) (as complexes with the crown ester) takes place on the surface of the coal paste electrode within 1.0 - 1.5 minutes. Copper and lead were determined in effluents containing Mn(II, III), Fe(II, III), Zn, Ag, Ti, Hg, Ge, Se, and Te with a sensitivity lower level of 9.5 X 10^{-9} (Cu) and 2 X 10^{-9} (Pb) mole per liter. Figures 2; references 4 (Russian).

Electro-Deposition of Finely Divided Powders of Iron-Nickel Alloy

947M0058B Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol. 59, No. 9, Sep 93 (manuscript received 8 May 92) pp 961-965

[Article by Ye. P. Zhelibo, V. A. Bagriy, and S. V. Remez, Colloidal Chemistry and Hydrochemisty Institute, Kiev; UDC541.135:621.762.274]

[Abstract] Powdered iron-nickel alloys are used in magnetic recording, relay switch technology, as catalysts, and as sintering activators for coarser powders. The traditional methods for preparing alloyed ultra-fine (micron and submicron) powders by reduction of oxalates and decomposition of carbonyls are both cumbersome and laborious. In a previous work an attempt was made to prepare ultra-fine iron-nickel powders by electrolysis in a double layered bath. However, the formation conditions and the properties of the resulting powders were not well studied. In the present work a study was made of the effects of the electrolysis conditions on the rate of formation, the yield according to current, the chemical and dispersed composition, the specific surface, and the magnetic properties of iron-nickel powders as prepared by electrolysis. Analysis of the resulting data demonstrates that by correct selection of the electrolysis conditions it is possible to prepare iron-nickel powders having the required particle size and the desired nickel content. Figures 2; references 12: 9 Russian, 3 Western.

Effect of Niobium Alcoholates on Processes of Anodic Oxidation of In-Sb Semiconductors

947M0058C Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol. 59, No. 9, Sep 93 (manuscript received 8 Jan 92, after revision 26 Jan 93) pp 965-967

[Article by E. S. Morozenko, Yu. B. Badayev, and Ye. A. Mazurenko, General and Inorganic Chemistry Institute, Kiev; UDC541.135.2:669.755:669.875]

[Abstract] Anodic oxidation is used widely in microelectronics to make dielectric layers having a metal-dielectric-semiconductor structure (MDP). In making an MDP based on the intermetallide In-Sb (a p-type semiconductor), the dielectric layer In_2O_3-Sb_2O_5 is prepared by anodizing In-Sb in the corresponding electrolytes. It is well known that the structure of the anode oxide coating is a most important factor which determines its electrophysical properties. The properties of the materials may be altered by doping the oxide coating. Thus doping the surface layer of Nb_2O_5 dielectric with indium significantly improves the electro-physical properties of the system Nb-Nb_2O_5-MnO_2. In another work it was demonstrated that the doping elements may also be added to the composition of the anode oxide coating by including them in the anode reaction in the anode form. In the present work a study was made of the effects of niobium alcoholate on the process of anode oxidation of the semiconductor In-Sb in a glycerate solution of sodium carbonate. It was demonstrated that there is an acceleration in the formation of the dielect ic film In_2O_3-Sb_2O_5 when doped with niobium ethylate. Possible causes for this accelerating effect are discussed. Figures 2; references 6 (Russian).

Adsorption of Steel Surface Modifiers in Cathode Region of Potentials

947M0058D Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol. 59, No. 9, Sep 93 (manuscript received 14 Apr 92) pp 968-973

[Article by G. S. Shapoval, A. A. Korzhenko, and I. Ya. Litvin, Bioorganic Chemistry and Petrochemistry Institute, Kiev; UDC622.692.47:620.197:541.13]

[Abstract] Cathodic surfactants have many useful properties such as the capability to inhibit corrosion, act as biocides, and the ability to adsorb onto the surfaces of various solid substances. These and other properties drew attention to these compounds for possible use to prevent corrosion in pipelines. This requires a more detailed study of these compounds on steel in the cathodic region of potentials. In the present work impedenceometry was used to demonstrate that N-alkyl-N-methyl-N,N-diethanolamine iodides are adsorbed onto the surface of

steel in the cathodic region of potentials, thereby lowering the volume of electric double layer at the metal-coating-electrolyte interfaces. This in turn has a significant effect on the rate of cathodic sloughing off of the protective polymeric coating and the rate of corrosion of the metal being protected. Figures 4; references 13: 7 Russian, 6 Western.

Equipment for Treating Pyromellitic Acid Dianhydride Production Off Gases

947M0055A Kiev EKOTEKHNOLOGII I RESURSOSBEREZHENIYE in Russian No. 2, Mar-Apr 93 (manuscript received 6 Aug 92) pp 25-30

[Article by R. Kh. Mukhutdinov and N. A. Samoylov, Ufa Petroleum Institute; UDC66.094.37:661.7: 547.536.4.002.68- 911.3:66.074.3]

[Abstract] Pyromellitic acid dianhydride, a basic source for the synthesis of heat resistant insulation materials, is obtained industrially by vapor phase oxidation of 1,2,4,5-tetramethyl benzene (durol). During production, the off gases from the oxidation stage are cycloned and vented to the atmosphere. These gases contain harmful organic substances in both the vapor and dispersed phases. The vapor phase consists mainly of durol and its oxidation products, while the dispersed phase contains organic dust particles (2.1 microns, average size) and consists of pyromellitic acid dianhydride (74-80 percent), 4,5- methylphthalic (12-14 percent), trimethyl, formyltrimellitic, and 4-methylphthalic, acid anhydrides and other substances. The dispersed phase is a pyrophoric substance which causes combustion and explosions in places where the dust accumulates. One of the least energy consuming methods for purging the off gases of organic matter is thermocatalysis. In the present work a three- stage scheme for treating the off gases is examined. The gases are passed sequentially through a blender-separator, a plate catalytic reactor, and a fluidized bed reactor (iron-chromium oxide catalyst). Design characteristics for the equipment and the results of industrial testing are presented. The off gases were 50 to 100 percent purged of pyromellitic acid dianhydride and other pollutants, depending on the operating conditions. Figures 3; references 5 (Russian).

Effluents From Electrolytic Production as Secondary Source for Leaching Metals

947M0055B Kiev EKOTEKHNOLOGII I RESURSOSBEREZHENIYE in Russian No. 2, Mar-Apr 93 (manuscript received 5 Dec 92) pp 54-56

[Article by N. I. Lebed, O. I. Bent, A. A. Yushin, and V. K. Yatsun, State Committee for Geology, Kiev; UDC622.7.012.7]

[Abstract] The state of the environment in Ukraine has been neglected for a long time, although recently there has been a notable improvement thanks to the efforts of scientific and production organizations. Top priority has rightly been assigned to the study of living nature and food products, water, and air. However, in the latter case only the aftereffects of pollution are being studied and not their causes and sources. Therefore, a specialized geological-economic study has been undertaken of one of most active environmental polluters, namely the electroplating industry. According to data from the Ministry of Environmental Protection, the annual waste within Ukraine comprises 550-560 million cubic meters, while the total accumulated volume is estimated to be 20 billion cubic meters. The greatest contributor is the mining industry which uses only 12 percent of its output as compared to developed countries which use two thirds of the output. The electroplating, chemical, radio technical, and electronic industries have significantly lower volumes of industrial waste, and therefore are not always counted in the inventory. However, it is these very wastes which contain significant concentrations of toxic and useful metals. It is also important to note that these industries are located throughout the entire territory of Ukraine, although the substantive composition of the wastes is far from being well studied. In one respect this limits the possibility of practical utilization of individual valuable components, and in another the lack of special sites for storing harmful substances results in their being dumped into sewage systems or landfills which are harmful to agriculture, surface and subterranean waters. Thus the Ukraine State Committee has assigned the Ukraine State Committee on Geology and Utilization of Minerals to carry out the development of land evaluation of industrial enterprises producing toxic metal wastes; identification, based on preliminary study of substantive composition of wastes which contain high concentrations of valuable components, especially metals; develop a listing of those enterprises which produce wastes deserving of laboratory-technical investigation to provide an evaluation of the possibilities and prospects for extracting valuable metals; preparation of a list of enterprises whose wastes require storage at special sites. In the present work the problems, methods and preliminary results of geological-economic study of electroplating wastes at the Cherkaskiy and Lvovskiy Oblasts were examined and the economic aspects of extracting metals were evaluated. Recommendations are provided for conducting further research.

Certification of Individual Means of Protection

947M0053A Moscow STANDARTY I KACHESTVO in Russian No. 12, Dec 93 pp 8-11

[Article by N. T. Timofeyeva and V. B. Okhlyand, Certification Institute (A-U)]

[Abstract] Individual means of protection (SIZ) play an especially important role in safeguarding humans in situations where there is a danger of interaction with harmful factors during production. Various SIZ have been classified according to GOST 12.4.011-89 and include 12 classes for hearing organs, nose, feet, arms, head, eyes, face, respiratory organs, and for falling from heights. At the present time, about 1000 SIZ items being are produced and used with varying degrees of protection. Effectiveness in using these means and devices depends not only on their protective properties, but also on their correct selection by taking into account the conditions under which they will be used. A decree of the GOSSTANDART established a system of certification for individual means of protection in 1993 which in turn established system structure and an order for conducting SIZ certification: starting on 1 Apr

93—SIZ for head and respiratory organs; 1 Jul 93—hearing organs, falling from heights and insulating garments; 1 Jul 94—feet, arms, SIZ made from plastics, and face, eyes, and skin; 1 Jan 95 special garments. The principles and order of SIZ certification is analogous to that of the European Community standards. A flow chart is provided which represents the structural system of the certification process. By the second half of 1993 ten certificates were issued on SIZ for respiratory organs and nine laboratories (centers) were accredited including the ITs [test center] "Sorbotekhn" and "EKOTsENTER" for testing filtration devices for respiratory organs (gas masks and anti-dust respirators). Figure 1.

Certification of Production of Individual Means of Protection

947M0053B Moscow STANDARTY I KACHESTVO in Russian No. 12, Dec 93 pp 12-14

[Article by I. N. Busakhina, Certification Institute (A-U)]

[Abstract] The organization and methodology of certification of production of individual means of protection (SIZ) are basically the same as for any other type of production. Monitoring production for the purpose of certification is carried out in accordance with a working methodology worked out by organs for the certification of production as applied to specific production of a SIZ. The methodology specifies the sequence and extent of checking of finished production, technological systems, maintenance and repair systems, and systems for control and testing. In the production of SIZ there are certain special features pertaining to the above first and second points. In checking and evaluating finished production special attention is devoted to registration, analysis and prophylaxis of defects outlined in the classifier which an enterprise presents together with other initial data needed for certification. In checking and evaluating technological systems, special attention is devoted to checking special and especially critical technological processes (TP). The main TP being checked (operations) on the fabrication of parts and assembly units of a production being claimed are stated in the methodology and must be stated in the list of critical defects outlined in the classifier. The defect classifier and list of checked TP (operations) for SIZ for respiratory organs are presented as an example.

Regulation for Testing Means of Individual Protection of Respiratory Organs in Domestic and Foreign Standards

947M0053C Moscow STANDARTY I KACHESTVO in Russian No. 12, Dec 93 pp 14-15

[Article by A. V. Korobeynikova, Technology and Organization or Production SRI, St. Petersburg]

[Abstract] Means for individual protection of respiratory organs (SIZOD) are used in those cases where equipment design or other factors endanger personal safety. The basic requirement of a SIZOD is to provide air to a worker that meets sanitary norms. In the case of filtering type SIZODs this means an ability to treat incoming air in such a way as to bring it to within PDK (maximum allowable concentration) levels. An isolating type SIZOD must also provide sufficient oxygen. Thus the procedures and methods for evaluating SIZODs involve certain special considerations. In domestic standards the evaluation methods are slanted toward determining how complete the device is in preventing harmful substances from entering the respiratory organs of a human being and the extent to which the SIZOD can maintain this air quality over the period in which it is expected to be used. Therefore the following basic conditions are regulated: the space velocity of the incoming air stream passing through the SIZOD and its components; type and concentration of a control substance in the air stream; relative humidity of incoming air; nature of the incoming air stream, i.e. steady or sinusoidal (simulating breathing); number of component parts in the SIZOD subject to testing; duration of exposure during testing, the period of time during which a control substance penetrates the component; criteria for evaluating penetration, methods for determining them, and their levels as specified in the evaluation; accuracy and errors of the testing equipment. The regulations are covered in GOST 12.4.034-85 SSBT SIZOD. Some regulations of foreign countries are also presented.

Synthesis of (7Z,9Z)-Dodecadienyl Acetate, Component of Sex Pheromones of Leaf Roller Moths Epinotia and Eucosma, Using Conjugated Diynols

947M0060G Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No. 9, Sep 93 (manuscript received 5 May 93) pp 1656-1660

[Article by Z. G. Chrelashvili, M. V. Mavrov, B. I. Ugrak, A. A. Kutin, and E. P. Serebryakov, Physical and Organic Chemistry Institute imeni P. G. Melikishvili, Tbilisi; Organic Chemistry Institute imeni N. D. Zelinskiy, Moscow; UDC632.936.2]

[Abstract] In several species of Lepidoptera related to Lasiocampidae, leaf rollers, and real silk worms, conjugated α, δ-disubstituted dienes with cis- and trans-double bond configurations are characteristic sex pheromone components. These also include (7Z,9Z)-7,9 dodecadienyl acetate (Z,Z-1) pheromone or a component of pheromone composition. These compounds are normally prepared by the Wittig reaction or by cross-conjugation of vinyl electrophiles with vinyl nucleophiles in the presence of palladium complexes. In the present work a study was made of two similar routes to the synthesis of the title pheromone using organo-cuprate conjugation of Z,Z-diene electrophiles, (2Z,4Z)-1-acetoxy-2,4-heptadiene or (3Z,5Z)-1-bromo-3,5-octadiene with ω-ter-butoxy-1-chloropentanome or -butane, respectively. To prepare the electrophiles, optimum conditions were determined for the reduction of 2,4-hepta- and 3,5-octadiene-1-ols into the corresponding Z,Z-alkadienols with activated zinc in a water- alcohol medium which facilitated high geometric purity of the products. Both schemes result in 1-ter—butoxy-7,9-dodecadiene (mixture of four isomers). Acetolysis of the latter results in the pheromone with traces of the stereoisomer. References 13: 3 Russian, 10 Western.

Effect of Nature of Silicon-Organic Compounds on Kinetics of Their Chemosorption on Surface of Pyrogenic Silica

947M0058A Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol. 59, No. 9, Sep 93 (manuscript received 7 May 92) pp 920-926

[Article by V. I. Bogillo and A. A. Chuyko, Surface Chemistry Institute, Kiev; UDC541.124.16:541.128: 546.287]

[Abstract] The chemosorption kinetics of alkylchlorosilanes, cyclic and linear organosilanes, and trimethylpseudohalides on the surface of pyrogenic silica were studied in previous works and a formula was developed which adequately describes the process kinetics. In the present work additional parameters for this formula were derived for the activation energy of the chemosorption of $(CH_3)_3SiX$ silanes and siloxanes on silica surface. The activation energy of electrophilic substitution of a hydrogen atom from the silanol groups of the surface by these compounds decreases with lowering strength of the Si-X bond and increasing inductive constant of the substituent X, as well as with decreasing enthalpy of reaction. References 12: 10 Russian, 2 Western.

CHEMICAL INDUSTRY

Russians Deny Existence of Miniature Neutron Bomb

MOD, Kurchatov Institute

947M0067A Moscow IZVESTIYA in Russian 14 Apr 94 p 2

[Unattributed article: "British Television Journalists Confirm That Russia Has Ball-Sized Neutron Bomb"]

[Text] (Reuters)—Journalists of British television's Channel 4 conducted an investigation and came to the conclusion that Russian scientists have invented a miniature neutron bomb the size of a baseball. The device was created by using what is called "red mercury."

The bomb's small dimensions make it very attractive to terrorists. Dr. Sam Cohen, creator of the American neutron bomb, stated, "This information terrifies me."

In conventional nuclear weaponry, plutonium is used to initiate a thermonuclear reaction. In the Russian device, "red mercury," which Russian science discovered 40 years before the United States, acts as an igniter.

Doctor Cohen supposes that Russian scientists have created a bomb no bigger than a baseball. It has a power of 10 metric tons of TNT, and its radiation is dispersed over a 600-meter radius, destroying everything living and leaving an insignificant background after itself.

Speculation regarding "red mercury" arose not long ago. "As far as we know, no unique material called 'red mercury' exists, stated Great Britain's Ministry of Defense. Materials called 'red mercury' have been subjected to expert examinations and deemed useless."

When he was in Siberia, Russian ultranationalist Zhirinovskiy threatened more than once to use the secret weapon "Elipton" against Bosnian Moslems.

Channel 4 television reporters met with scientists in Russian and traveled to Yekaterinburg, where RM20/20 "red mercury" is said to be produced at a secret plant. British expert Frank Barnabey took part in these conversations and finally came to the conclusion, "I am certain that Zhirinovskiy was telling the truth."

From the editor: For an explanation, IZVESTIYA correspondent Nikolay Burbyga turned to the ministries and departments that deal with weaponry.

"Of course, we have" secret developments," they said at the Ministry of Defense, but what British television reporters are stating is totally absurd. You should even be ashamed to comment on it."

The answers obtained at the Kurchatov Institute were no less categorical. Specialists involved with prospective scientific weaponry developments stated that "red mercury" has been talked about for a long time. But no one has succeeded in seeing it or "touching" it because a material with such characteristics simply does not exist in nature.

MOD Representative

947M0067B Moscow IZVESTIYA in Russian 15 Apr 94 p 3

[Article by IZVESTIYA correspondent Aleksandr Krivopalov: "All England Talking About "Red Mercury" and New Russian Weapon": "The documentary about the new secret weapon of mass destruction that has apparently been created in Russia and shown on British television's Channel 4 is being discussed in London"]

[Text] London—The portable bomb that is barely the size of a teacup or ball is apparently capable of destroying everything living within the radius of a modern large city or rayon.

The British have been working on gathering material about this for an entire 18 months, trying to find confirmation of the rumors that have long roused the Western press to the effect that "red mercury," whose very existence is denied by scientific-technical experts, is being brought in from Russia by some sort of s.. ret contraband channels.

No, states G. Roberts, the leader of the narrative in the sensational English television investigation, this substance is not a myth. It is the main component in the "pure" thermonuclear bomb that was apparently made in Russia and no where else in the world. True, his Russian partners in conversation generally remain anonymous on the topic of "red mercury," and their evidence does not, it must be confessed, sound too convincing.

The attempt to obtain responsible and knowledgeable commentators ultimately led the film's authors to Yekaterinburg, where they uncovered a plot very reminiscent of the old James Bond hits: secret meetings at twilight with some unknown persons who initially promised to provide the necessary information but disappeared at the last moment, afraid of the consequences.

Nevertheless, the group from England was apparently able to obtain secrets about a weapon that may become a new, even more terrifying threat for all mankind. They met with Russian scientists who had evidently themselves been personally involved in working on this project for 5 years. In any case, the film's consultants were convinced of the soundness of this evidence.

Another prominent expert in nuclear physics, the American professor Cohen, stated that as far as can be judged based on the materials gathered by the British television team, American scientists are lagging very much behind their Russian colleagues in this area. In Cohen's opinion, the spread of nuclear weaponry in the world will surely be impossible to contain.

The broadcast's finale was an interview with the director of a large German firm. The said participant announced that he has personal knowledge of sales of "red mercury" from Russia so large that they terrify him.

A Russian Federation Ministry of Defense representative denied the suggestion of the existence of either "red mercury" or a new "mini-bomb" created on its basis (see IZVESTIYA, No. 70).

Starting Compounds for Preparing High Temperature Superconducting Films by CVD-Method

947M0060A Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No. 9, Sep 93 (manuscript received 21 Oct 92, after revision 3 Jun 93) pp 1529-1523

[Article by V. G. Minkina, Heat and Mass Transfer Institute imeni A. V. Lykov, Minsk; UDC537.312:541.49]

[Abstract] The CVD method of chemical deposition from the vapor phase, used widely to prepare high temperature superconductor film, is easy to control, has a high film growth rate, makes it possible to obtain high quality films on large areas and complex substrates, and provides high temperature superconductor films with perfect surface structures without additional high temperature calcining. One of the most important problems arising in chemical precipitation from the vapor phase is the selection of volatile compounds which may be converted into the vapor phase and recondensed without change in composition. Low polarity compounds having a covalent bond between the metal atom and the ligand are the most volatile. The molecules of the complex must not interact with each other or with other compounds. Metal complexes with β-diketones are frequently used as starting materials having acceptable volatility to form fine superconducting films from the vapor phase. In the present work a study was made of the effect the structure of the ligand and the nature of the metal have on the volatility of the complexes used to prepare superconductor films having the composition Y-Ba-Cu-O and Bi-Sr-Ca-Cu-O by using the CVD method. Values are presented on the thermodynamic characteristics of vaporization of the above compounds, their heat and temperature of sublimation, and conditions for thermal decomposition and storage. References 60: 19 Russian, 41 Western.

Photodecomposition of Eu(III) Complexes With Macromolecular Ligands Based on Acrylic Acid

947M0060E Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No. 9, Sep 93 (manuscript received 28 Oct 92) pp 1559-1562

[Article by A. G. Mirochnik, N. V. Petrochenkova, and V. Ye. Karasev, Chemistry Institute Far Eastern Branch RAN, Vladivostok; UDC546.661:541.64:541.144.8]

[Abstract] The use of luminescent chelates of rare earth elements as active additives to polymers requires stabilization of the luminescent site in the polymer matrix as well as an increase in the thermal and photo resistance of these polymers. It therefore seemed expedient to prepare and study the spectral-luminescent and photochemical properties of complexes of rare earth elements with polymers. Only a few works on this problem have been published. In the present work a study was made of spectral-luminescent and photochemical properties of Eu(III) complexes with copolymers of acrylic acid and esters of methacrylic acid. The photochemical behavior of the macromolecular complexes was observed to be markedly different from the properties of the low molecular analogs, e.g. during photodecomposition the luminescent intensity of Eu^{3+} does not diminish, but rather increases noticeably. The effectiveness of Eu^{3+} luminescent glow is a function of the composition and structure of the initial macromolecular complex. A low metal concentration, low acrylic acid content, and an increase in the length of the alkyl radical on the methacrylate facilitate intensification of the effectiveness of luminescent glow of the rare earth ion. Figures 3; references 9: 4 Russian, 5 Western.

Oligomeric Linear and Star-Shaped Carbasol-Containing Siloxanes

947M0058E Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol. 59, No. 9, Sep 93 (manuscript received 7 May 92) pp 997-999

[Article by L. R. Kunitskaya, V. N. Starenkaya, and Yu. P. Getmanchuk, Kiev State University imeni T. G. Shevchenko; UDC678.621.315.772.93]

[Abstract] Low melting point oligomers are used in photothermoplastic recording as a recording medium. An electric charge placed on a film of such material remains intact in darkness and diminishes under illumination. The remaining charge in unlit portions of the film is capable of deforming the film when heated to a temperature above the flow point, thereby forming an image. In the present work linear and radial (star-like) carbazole-containing oligomers, used as recording means for photo-thermoplastics, were synthesized. The coefficients of molecular packing of the synthesized oligomers were determined, and it was demonstrated that on transition from the linear to the radial (three and four rays) form, the coefficient of molecular packing decreases and the fraction of free space increases. This confirms the branched structure of the radial form. References 5 (Russian).

Computing the Change in Average Molecular Weight During Polymer Destruction

947M0058F Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol. 59, No. 9, Sep 93 (manuscript received 23 Apr 92) pp 1000-1003

[Article by A. V. Shiychuk and V. S. Lutsyak, Chernovtsy State University; UDC64:66:.64:678.019.3]

[Abstract] It is extremely difficult to quantitatively determine the extent of destruction in a polymer. Determination of an accurate value by direct computation of change in average molecular weight is also complex. Therefore, it is more expedient to use other average molecular weight values, such as average viscosity and average weight. However, an estimate of rupture density of this type may be executed simply only for some particular molecular weight distribution, e.g. Flory distribution. For any other molecular weight distribution the problem becomes significantly more difficult, owing to the change in form in molecular weight distribution during the destruction. In the present work a generalized formula advanced by Charlseby is examined. With this formula, it is demonstrated that for a given polymer having an initial Schultz distribution, the computation may be completed only for a limited interval of index of destruction values, and this interval becomes narrower as the index of distribution increases. This formula is not suitable for logarithmic-normal distribution. Figures 2; references 6 (Russian).

Preparation of Metal-Polymer Films by Decomposition of Tetramethyl Tin in High Frequency Discharge and Direct Current Discharge

947M0058G Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol. 59, No. 9, Sep 93 (manuscript received 17 Apr 92) pp 1003-1007

[Article by V. V. Petrov, A. A. Kryuchin, I. O. Kostenko, and V. G. Kravets, Information Recording Problems Institute, Kiev; UDC539.4.019.2]

[Abstract] The preparation of thin films by dissociation of metal-organic compounds is finding applications in microelectronics. This method may also be used to prepare recording media for optical information carriers. Systems where the metal is included in the hydrocarbon matrix are particularly promising. The precipitation processes and the properties of the resulting polymer films are affected by such parameters as pressure, flow rate of the organometallic compound, temperature of the substrate, and energy characteristics of the low temperature plasma, which depend greatly on the type of discharge. In the present work a study was made of the processes for preparing thin films by dissociation of tetramethyl Sn in a high frequency discharge and in a direct current discharge. Differences in the Raman spectra of the tetramethyl Sn in the liquid and film states were established, and precipitation conditions were determined under which the resulting films have maximum sensitivity and signal-to-noise ratio for use as recording media for optical recording of information. Figures 2; references 6 (Russian).

Synthesis and Properties of Polypinacols Produced by Reacting Aromatic Dialdehydes With Samarium Iodide

947M0064A Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol. 36 No. 1, Jan 94 (manuscript received 1 Jun 93) pp 10-14

[Article by N.Ye. Brandukova, Ya.S. Bygodskiy, and S.V. Vinogradova, Elementoorganic Compounds Institute imeni A.N. Nesmeyanov, Russian Academy of Sciences, Moscow; UDC 541.64:546.659:547.571]

[Abstract] For the first time, polypinacols were synthesized by reacting aromatic dialdehydes with samarium iodide under mild conditions. Tere- and isophthalic aldehydes and bis-(3-hydro-formyl-2,4,6-trimethylphenyl(methane) [BHPM] that had been purified by vacuum sublimation were used as starting monomers. Terephthalic aldehyde was reacted with SmI_2 in tetrahydrofuran [THF] in an argon atmosphere. Hydrolysis was performed with diluted hydrochloric acid. A study of the effect of temperature on the reaction in the temperature interval from -25 to +65°C demonstrated that a portion of the aldehyde groups do not participate in the reaction at low temperatures (from -25 to -20°C). Increasing the reaction temperature to 5-7°C results in a slight increase in the polymer's logarithmic viscosity; however, once again not all the aldehyde groups are involved in the condensation. Finally, when the temperature is increased all the way to 65°C, it is possible to obtain a polymer of the desired structure (i.e., a polymer with no absorption band at 1,680 cm^{-1} and intensive absorption bands at 3,400-3,500 cm^{-1}). The polymer's molecular weight also increases slightly as the reaction temperature is raised; however, the solubility in organic solvents of the polymer synthesized at 65°C is significantly diminished. The said polymers only dissolve upon protracted heating in amide-type solvents and lose their solubility when the duration of the synthesis process at 65°C is increased to several hours (evidently on account of cross-linking at the hydroxyl groups). The noticeable ash (samarium) content in the reaction products was also deemed attention worthy. Increasing the concentration of dialdehyde dissolved in the THF from 0.05 to 0.50 mol/l did not result in any increase in the polymers' viscosity characteristics but did increase the tendency toward formation of coordination compounds with samarium (even those products purified by reprecipitation contained samarium). The polypinacols obtained from other dialdehydes and SmI_2 under similar conditions were found to contain carbon and hydrogen in quantities corresponding to the theoretically calculated amount and no ash at all. This finding was attributed to the fact that side processes expending OH groups are suppressed as a result of steric factors and because of the fact that the mutual effect of the aldehyde groups in such cases is weak. The said compounds also had a lower molecular weight than the polymers formed from terephthalic aldehyde. This lower molecular weight was attributed to the lower concentration of starting monomer on account of its limited solubility in THF. The newly synthesized polymers on the basis of BHPM were white powder materials, and those synthesized on the basis of tere- and isophthalic aldehydes were

yellow powders. All had an amorphous structure, a softening temperature of 160 to 190°C, and a 5 percent mass loss in air at 200-230°C. The polypinacols based on BHPM had the lowest softening points and temperature of onset of heat destruction. All of the newly synthesized polymers were distinguished by their solubility in a number of organic solvents (those based on BHPM were soluble in chloroform and even acetone), and all were interesting as functional compounds from the standpoint of subsequent synthesis of derivatives at their hydroxyl groups (e.g., by reaction with isocyanates, etc., coordination with organometallic compounds, and synthesis of poly-α-diketones via oxidation). The possibility of modifying the newly synthesized compounds by reacting them with aldehydes to form polymers that are easily soluble in various organic solvents was demonstrated. Tables 2; references 13: 5 Russian, 8 Western.

Quasi-liquid Gas Separation Membranes Based on Crazed Polymers

947M0064B Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol. 36 No. 1, Jan 94 (manuscript received 22 Apr 93) pp 123-128

[Article by Ye.A. Sinevich, M.S. Arzhakov, I.V. Bykova, M.A. Krykin, N.A. Shitov, S.F. Timashev, and N.F. Bakeyev, Physical Chemistry Scientific Research Institute imeni L.Ya. Karpov, Moscow; UDC 541.64:539.3:533.5]

[Abstract] Crazed substrates were produced by using nonoriented polyethylene terephthalate [PETP] (meeting specification TU 6-19-138-79) and polypropylene (meeting state standard GOST 26996-86 and specification TU 01020) films with thicknesses of about 100 μm. The semifinished products were stretched until a specified deformation was achieved and then dried while held with clamps or left free. Alkyl siloxane-type organosilicon compounds were then used as a filler for producing quasi-liquid membranes. The filler was incorporated into the substrate by replacing the crazing medium. This was done by stretching amorphous PETP in n-propranol, releasing it from the clamps, and transferring it into polymethylsiloxane [PMS] or polyethylsiloxane [PES] fluid. After several minutes it completely replaced the propranol in the crazes' micropores. Not all the PMS fluids used proved to be suitable fillers. The highly volatile ones (e.g., PMS-10) lost up to 50 percent of their mass in the first 4 days of storage. As a result, PMS with only very slight volatility (e.g., PMS-20 and PMS-100) were used along with PES-5 and fractioned oligodimethylsiloxanes. Samples of quasi-liquid membranes retained their dimensions after months of storage. The permeability of the quasi-liquid membranes with PMS or PES fillers was thousands of times greater than that of films of amorphous PETP with a selectivity of $\alpha_{O2/N2}$ = 2.2 to 2.4. Furthermore, the parameters characterizing the newly synthesized quasi-liquid membranes were on a par with those of Silar-type block copolymers, and their mechanical properties even surpassed those of block copolymers. As anticipated, the quasi-liquid membranes with the more viscous filler (PMS-100) had lower permeabilities because of the decrease in the coefficient of diffusion of gas in a liquid as that liquid's viscosity increases. A mechanism of active gas transfer was used to increase the quasi-liquid membranes' selectivity. Through directed alteration of the crazing mechanism, the researchers were able to obtain microporous materials with improved permeability. Decreasing the thickness of the working layer of quasi-liquid membrane and using polymers with a high permeability were said to be the simplest ways of further increasing the performance characteristics of crazed quasi-liquid membranes. Figures 4, table 1; references 22: 11 Russian, 11 Western.

ANALYSIS, TREATMENT, MINING

Effectiveness of Using Volt-Ampere Methods for Automatic Monitoring Reactants in Gold Extraction Plant

947D0018A Moscow ZAVODSKAYA LABORATORIYA in Russian Vol. 60 No. 3, Mar 94 (manuscript received 5 Mar 93) pp 11-13

[Article by V.N. Kiryushov and Yu.B. Kletenik, Institute of Solid-State Chemistry and Raw Mineral Processing at Russian Academy of Sciences, Siberian Department, Novosibirsk; UDC 543.253.65.011.56]

[Abstract] A technology of automatic pH control by the volt-ampere method with a hard indicator electrode has been developed at the Institute's electrochemical laboratory for monitoring the reactants participating in gold extraction from pulp. As reactants are being used thiourea or sodium cyanide. Two transducer configurations are proposed, one with a bar electrode in an epoxy sleeve and one with a long enamel-coated wire electrode. As the electrode material have been selected graphite for use with thiourea and graphite or copper for use with sodium cyanide. A graphite electrode is also used for monitoring iron in $FeSO_4$ solution ($Fe^{++} \rightarrow Fe^{+++}$ oxidation reaction) and for monitoring gold in thiourea or NaCN solution. Both electrodes are renewable ones, purity being restored by mechanically slicing off a thin surface layer. The electrical conductivity of the reactants is usually adequate for accurate measurements, especially when some H_2SO_4 has been added. The operating ranges are: 5-20°C for copper electrode with NaCN, 10-40°C for graphite electrode with NaCN, 20-50°C for graphite electrode with thiourea. Each transducer includes an electronic circuit for compensating the effect of temperature fluctuations within those ranges. For monitoring the gold content has been devised the inverse volt-ampere method, to either replace or supplement conventional method of atomic absorption spectrometry. The analyzer with any of the two transducers operates with direct current in either the straight mode or the differential mode, recording the current at the instant when the analytical signal peaks. It includes a regulator of the electrode renewal cycle needed for polarization and measurements of the variable voltage. The apparatus, built at the by the Scientific-Industrial Association "Soyuzalmazozolotoavtomatika" (All-Union Diamond and Gold Automation), has successfully passed lengthy tests in a gold extraction plant. Tables 1; references 15.

COMPOSITE MATERIALS

Degradation Processes in Silicon Carbide Refractories Exposed to a High-Temperature Gas Stream

927D0208A Moscow OGNEUPORY in Russian No. 2, Feb 92 pp 2-6

[Article by A. K. Karklit, All-Union Institute of Refractories; UDC 666.762.852.001.4]

[Abstract] Degradation processes were studied in silicon carbide refractories exposed to high-temperature gas streams. Fired and unfired specimens were made from powders with grain sizes ranging from Nos. 3-125. The fired specimens were made with either a silica or a nitride binder, or they were siliconized (10-15% carbon in the refractory mass and firing in silicon vapors), and silica glass, bentonite, ferrosilicon, and boron carbide were added to impart strength to the silica binder and inhibit SiC oxidation. The unfired specimens were made with Bakelite binder polymerized at 180-200°C. Specimens of each type of refractory with select physical and mechanical properties were tested in a high- temperature (2650-2730 K) and velocity (2300 m/s with a 1.2 air- fuel ratio) gas stream created by igniting alcohol in oxygen (nearly 13% O_2). Test duration was 15 s, which is much shorter than usual for this type of test. The specimens were cylindrical, 50 mm long and 20-25 mm in diameter. Change in specimen height during the 15-second test period was recorded photographically. Oxidation of the SiC with the formation of SiO, SiO_2, and CO was the main process resulting in a dramatic alteration of the composition and properties of the specimens in the layer below the one exposed to the gas stream. The degradation processes occurred at the fastest rate within the first 5 s, after which the rate stabilized. The silica binder specimens had the greatest specimen height and mass loss rates (0.88 and 1.92 average specimen height loss, in mm/s, and degradation rate, in kg/sq m x s, respectively), followed by the siliconized specimens (0.85 and 2.46) and those made with the nitride (0.77, 1.81) or Bakelite binder (0.68, 1.63). The latter also had less SiC oxidation and a correspondingly lower proportion of SiO_2 in the layer concerned. Figures 9, tables 5; references 9: 7 Russian, 2 Western.

Role of Sintering Additives in Lime Refractory Production Technology

927D0208C Moscow OGNEUPORY in Russian No. 2, Feb 92 pp 13-16

[Article by R. M. Bezikova, Leningrad Institute of Technology Central Weather Bureau, G. I. Kuznetsov, and V. M. Gropyanov, All- Union Institute of Refractories; UDC 666.762.62.046.44]

[Abstract] A new lime refractory production process that utilizes titanium oxide as the sintering additive was proposed. TiO_2 was selected because the eutectic temperature of $CaO-TiO_2$ is 2010 K and because calcium titanates are resistant to atmospheric hydrolysis. The refractory is made by pulverizing pure or esp. pure calcium carbonate to a particle size of 100-150 μm and adding 2-6% TiO_2 or 2-4% titanium ferrite. (Optimum additive percentage was determined empirically.) A 5-% aqueous solution of sulfite waste liquor with a density of 1.15 g/sq cm is used as the binder. The green mass is then pressed into briquets and fired at 2020 K. The lime refractory material has an apparent density of 2.75-3.03 g/cu cm, apparent porosity of 3.4-9.8%, compressive strength of 60-140 N/sq mm, and a loaded deformation temperature of 1610 to 1700°C or higher. Figures 5, tables 1; references 5: Russian.

Alloying Silicon Carbide Components With Aluminum During the Process of Siliconizing Firing

927D0208B Moscow OGNEUPORY in Russian No. 2, Feb 92 pp 6-9

[Article by S. V. Kazakov, A. S. Rabinovich, and A. S. Kheyfitz, All-Union Institute of Refractories; UDC 666.762.852.017:620.187];621.762]

[Abstract] The alloying of silicon carbide components with aluminum was studied to determine its effect on component structure and electrical properties. Three tubular specimens were extruded from an 85 wt. % primary SiC (SiC') mass and fired in a siliconizing packing at temperatures between 1900-2200°C for 5.5 to 6 h in a resistance furnace. During firing, the specimens were arranged in a symmetrical fashion relative to the tubular graphite heating element. Sintering of the green extrusions and structural formation was more readily effected by the addition of process carbon to the raw material and by the formation of carbon residue released during thermopyrolysis of the binder. These carbons, together with the carbide-forming elements present in the packing, helped to form secondary SiC (SiC''). In order to alloy the SiC with aluminum, an aluminous substance was also added to the packing. After they had cooled, the specimens were fired a second time. It was found that this method of forming SiC components creates a layered structure in which SiC'' grains are alloyed with aluminum, and that this structure promotes consistent electrical resistivity throughout the component cross-section. The degree of alloying can be monitored by X-ray microspectrometry. Electrical resistivity can be estimated within the framework of a generalized model of conductivity in a multi-component medium, in which SiC forms a continuous matrix, and SiC' grains make up a discrete phase. Figures 2, tables 1; references 11: 9 Russian, 2 Western.

Electrical Conductivity of CeO_2- Ta_2O_5 Ceramics in Air and Combustion Gasses

927D0208D Moscow OGNEUPORY in Russian No. 2, Feb 92 pp 19-21

[Article by F. A. Akopov, B. M. Barykin, G. Ye. Balyano, Yu. D. Novov, and Ye. P. Pakhomov, Institute of High Temperatures of the USSR Academy of Sciences; UDC 666.762.6.017:537.311.3]

[Abstract] Cerium dioxide-tantalum oxide ceramic material was studied to determine the combined effects of a gaseous atmosphere and the tantalum oxide alloy on its electrical conductivity. More than 99.8% pure cerium dioxide and tantalum oxide powders were mixed to form compositions in which the proportion of tantalum oxide was 0.5, 2.3, or 5%. The powders were then briquetted, fired at 1870°C for 5 h to synthesize a solid solution, and re- pulverized to obtain fractions from 0.65 to less than 0.05 mm. Bar-shaped specimens 7 x 7 x 70 mm were compacted at 100 N/sq mm from tri-fraction mixtures of the powders and fired at 1820 K for 6 h. The fired specimens had an apparent porosity of 18-20% and a total porosity of 20-22%. Electrical conductivity was measured with four PR-30 platinum-rhodium probes utilizing direct current. In the first series of tests, the specimens were exposed to atmospheric air, and in the next series of tests, to an atmosphere of combustion products created by igniting propane in oxygen at air-fuel ratios of 0.7, 0.9, and 1.2. It was found that alloying cerium dioxide with tantalum oxide greatly increases the material's conductivity in air (to the solid solution saturation point). Unalloyed cerium dioxide ceramics exposed to combustion products have a much higher electrical conductivity than those exposed to atmospheric air. Moreover, the lower the air-fuel ratio, the higher the conductivity. Alloying cerium dioxide lowers the sensitivity of the conductivity of this material to the composition of the gaseous atmosphere of combustion products, especially for saturated solutions of tantalum oxide in cerium oxide. Figures 4; references 3: Russian.

Uses for Non-Destructive Methods of Refractory Quality Control

927D0208E Moscow OGNEUPORY in Russian No. 2, Feb 92 pp 21-23

[Article by V. A. Kononov, Rosogneupor, and S. V. Martynenko, Central Scientific Research Institute of Ferrous Metallurgy; UDC 666.76.017:620.179.16]

[Abstract] Non-destructive methods of assessing the physical and mechanical properties of refractory products are being more widely used in place of destructive testing methods throughout the refractories industry and by end-users of refractory products to ensure 100% quality control. The Novomoskva refractories plant is using x-ray analysis to detect inclusions, variation in wall thickness, graphite distribution, and internal defects such as cracks and splits in the refractory components of continuous casting machines. Radio-frequency inspection methods are being used primarily to measure porosity. Various acoustical methods, such as the shadow and echo methods and acoustical emission, are being used extensively by U.S., Japanese, and European firms for specific applications. For example, acoustical emission is being successfully used to assess deformation and destruction mechanisms and heat resistance. The echo method is used to detect internal cracks and cavities and to measure wear and the useful thickness of linings in thermal processing equipment. Ultrasound is being used in conjunction with physical measurements to measure the strength of a refractory material or product. Acoustical resonance is being used at the Vnukov refractories plant to measure density, porosity, and the mechanical strength of the plate linings of slide valves. These methods are highly accurate and reproducible and enable refractories producers to effect substantial savings in quality control costs while enabling end-users to avoid costly equipment failures. Figures 3; references 15: 11 Russian, 4 Western.

Testing Refractories Used in an Experimental Vessel for Acid Oxygen-Process Steelmaking

927D0208G Moscow OGNEUPORY in Russian No. 2, Feb 92 pp 31-33

[Article by V. I. Drozd, V. L. Bulakh, S. N. Romanenko Ukrainian Scientific Research Institute of Refractories, R

V. Starov, and M. N. Yednak, Institute of Ferrous Metallurgy; UDC 666.762.2:[669.184.244.66:669.184.225.4]

[Abstract] Experiments were performed to determine the factors affecting the service life of dinas linings in oxygen-process steelmaking vessels. Laboratory specimens were formed from 100% Ovruch quartzite on a laboratory hydraulic press under 50 N/sq mm of pressure and fired at 1360, 1380, and 1420°C for 6 h to effect different degrees of quartz degeneration. Two different compositions, No. 1 and No. 2, were formulated, depending on the additives used in the refractory mass. For both compositions, density decreased while apparent porosity and compressive strength increased as the firing temperature increased. The greatest proportion of residual quartz was found in the refractory compositions fired at 1360°C, and dinas No. 1 had more residual quartz than dinas No. 2. Therefore, dinas specimens fired at this temperature were used throughout the rest of the study. Thermal resistance was determined by measuring the thermal expansion coefficient, thermal conductivity, bending strength, and shear modulus of the dinas at temperatures ranging from 20 to 1300°C. These data showed that the thermal resistance of the specimens sharply increased as the average temperature increased, especially at temperatures above 600°C. Moreover, dinas No. 1 had greater thermal resistance than dinas No 2. The slag resistance of the dinas specimens was then tested by drilling a hole through the center of the cube-shaped test specimens, heating them in a Kryptol furnace to a temperature of 1670°C, and allowing melted slag of typical composition to drip through the hole. The same test was performed on specimens of DM industrial dinas and MKV-72 mullite-fused alumina. The specimens were then cross-sectioned and the area of slag impregnation measured. Dinas No. 1 specimens had the greatest slag resistance: 25% of their area was penetrated by the slag. Dinas No. 2 specimens had 30% of their area penetrated by slag, and the other refractory specimens were completely impregnated. Petrographic analysis of specimen cross-sections revealed the presence of a distinct three-zone structure consisting of a least-changed zone, a transitional zone, and a reaction zone. The experimental data were used by the Krasnogorov refractories plant to manufacture a test batch of standard-size dinas lining materials, which were tried out in the 0.3-t laboratory steelmaking vessel at the Institute of Ferrous Metallurgy. Blowing time was 10-12 min., and the average post- blowing melt temperature ranged from 1600 to 1720°C, averaging 1660°C. In comparison with the DM dinas and MKV-72 linings, dinas No. 1 proved to have the greatest overall resistance to the erosive effects of the blowing process in every respect and in nearly every section of the vessel, except for the cylindrical part and the throat, where the MKV-72 was better. The dinas lining also eroded more uniformly than the other linings. The lining wear pattern was typical for that of oxygen process steelmaking vessels. Depending on process temperatures and times, the maximum wear rate of dinas linings should be comparable to that of basic refractory linings. It is anticipated that considerable economies in raw materials and improvements in steel quality will be realized by converting to acid refractory linings such as dinas in oxygen- process steelmaking. Figures 2, tables 5.

Metallurgical Waste—Raw Materials for Refractory Production

927D0208F Moscow OGNEUPORY in Russian No. 2, Feb 92 pp 23-25

[Article by T. V. Chusovitina, I. I. Ovchinnikov, N. L. Sizova, Ye. N. Menshikova, L. B. Khoroshavin, S. N. Tabatchikova, T. M. Golovina, and L. S. Beklemisheva, Eastern Scientific Research Institute of Refractories; UDC 669.002.68:666.762]

[Abstract] Results were presented from a technical and economic assessment of using various types of metallurgical waste in the production of refractory materials. Magnesia-silicate slags from the Serov ferroalloy plant were used to produce periclase- spinellid-forsterite linings for the anode furnace of the Kyshtym electrolytic plant. These linings were comparable in durability to chromite-periclase linings. Forsterite-spinel heating furnace bottoms for the Chelyabinsk forging press and forsterite-spinellid teeming vessels for the Chelyabinsk metallurgical combine were made from high-carbon ferrochromium slag at the Magnesite plant. The furnace bottoms were 2-4 times more durable than those made with conventional raw materials, and the teeming vessels were as durable as periclase-graphite vessels. Use of these slags is calculated to save 2.1 million rubles per annum in raw materials costs and 157 thousand rubles per year in savings from reduced environmental damage. Savings from transporting and storing these wastes is expected to be 96.5 thousand rubles annually. The formulas used to arrive at these figures are presented, and other examples of refractories produced using metallurgical wastes are discussed. Tables 1; references 5: Russian.

Optimization of Hypersonic Wings

947J00344 Moscow ZHURNAL VYCHISLITELNOY MATEMATIKI I MATEMATICHESKOY FIZIKI in Russian Vol. 34 No. 3, Mar 94 (manuscript received 26 Feb 93, after revision 10 Sep 93) pp 446-460

[Article by V. N. Golubkin and V. V. Negoda; UDC 517.958:533.7]

[Abstract] With application of the theory of a thin shock layer the article gives a formulation of the problem and a method for solution of the problem of optimization of wings with a short elongation in a hypersonic flow and at different angles of attack, the objective being ensuring a maximum aerodynamic quality. As a result of a parametric numerical study it was found that the optimum solution has two branches and the optimization process has a bifurcation character: with some wing span value there is a jumplike switch from one branch of the solution to another, accompanied by a fundamental change in the appearance of the optimized wing. The characteristic configurations of optimum wings are illustrated. An appreciable gain in hypersonic quality is obtained in a wide range of angles of attack. An algorithm is proposed for computing pressure in the inverse problem of streamline flow with a given form of jump. The pressure distributions on the surface of optimum wings are studied. Computations of aerodynamic forces are made by direct integration of pressure, making it possible to refine the maximum hypersonic quality value, which proved to be greater than that found by the authors earlier using an approximate formula. This article represents a continuation of earlier work along these same lines by the same authors ("Optimization of Spatial Configuration of Supporting Surfaces With Short Elongation at Hypersonic Velocities," ZH. VYCHISL. MATEM. I MATEM. FIZ., Vol. 31, No. 12, pp 1858-1870, 1991; "Increasing Aerodynamic Quality of Wings With a Short Elongation at Hypersonic Velocities," PRIKL. MATEM. I MEKHAN., Vol. 56, No. 3, pp 392-403, 1992) and draws heavily on these materials. Figures 7; references: 9 Russian.

Generation of Electron Beam and Microwave Radiation Pulses by Energy of Chemical Explosives

947J00331 Moscow TEPLOFIZIKA VYSOKIKH TEMPERATUR in Russian Vol. 32 No. 1, Jan-Feb 94 (manuscript received 19 Feb 93) pp 127-132

[Article by Ye. I. Azarkevich, A. N. Didenko, A. G. Zherlitsyn, Yu. V. Karpushin, A. A. Leontyev, G. V. Melnikov, V. B. Mintsev, A. Ye. Ushnurtsev, G. P. Fomenko, V. Ye. Fortov, V. I. Tsvetkov, V. B. Shneyder and B. K. Yaselskiy, Scientific Research Center for Thermophysics of Pulsed Effects, NO IVT, Russian Academy of Sciences, Moscow; UDC 621.385.65537.813]

[Abstract] Experimental studies were made of the generation of a relativistic electron beam and pulsed microwave radiation using the energy of chemical explosives. The microwave generator used was a highly precise relativistic generator based on a triode with a virtual cathode. The energy of a strong relativistic beam is transformed with an efficiency up to 30-40% into the energy of an electromagnetic field with the oscillatory motion of electrons in a potential well created by the real and virtual cathodes. High-voltage explosive-magnetic generators with interception of the magnetic flux, which are fed by spiral explosive-magnetic generators, were developed for transforming the explosion energy into electromagnetic energy. The matching of the impedances of the explosive-magnetic generators and the relativistic generator, as well as the shaping of the necessary form of the electric pulse, was accomplished using electroexplosive current interrupters. As a result, voltage pulses up to 600 kV with a steepness of the leading edge about 60 ns are sent to the relativistic generator; the amplitude of the current across the triode attained 16 kA. The peak power of the microwave radiation sent into the atmosphere was not less than 100 MW. A model of operation of system elements is proposed. The experimental apparatus is described in detail. It is shown that the theoretical computations are reasonably consistent with experimental data. Figures 6; references 19: 16 Russian, 3 Western.

Compensation of Aberrations in Real Optical Systems by Nonaxisymmetrical Retouch of Surfaces

947J0022A St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 8, Aug 93 (manuscript received 23 Jan 93) pp 60-63

[Article by M.A. Gan, doctor of technical sciences, S.I. Ustinov, candidate of technical sciences, and A.A. Starkov, All-Russian Science Center "State Institute of Optics imeni S.I. Vavilov"; UDC 535.317.6]

[Abstract] Retouch of surfaces for compensation of aberrations in real optical systems producing a diffractional image is considered, the r.m.s. error of residual wavefront aberrations at some point of the field being serving as the criterion of compensation quality at that point. The problem is to minimize the functional $\Psi = (1/m)\Sigma[RMS](i)^2$ ($i = 1,...,m$) representing the integral compensation quality criterion. The problem is solved for an objective with wave aberrations $W_i(x,y)$ at points $i = 1,...,m$ and their decrement $\Delta W_i(x,y)$ as a result of retouch at these points in the (x,y) plane. For simplicity but without loss of generality, all mean aberrations and their mean decrements are assumed to be zero in the pupil. The retouch profile is represented by a set of analytical functions, preferably polynomial power functions with coefficients $\alpha_{1,...,n}$. An exact numerical solution is very laborious, especially so because the light rays must be tracked through a system with nonaxisymmetric errors of surface treatment. Applying the theory of small perturbations is shown to simplify the problem and an "approximate optimization" in accordance with that theory is proposed, the necessary condition for functional Ψ to be zero being that its all its partial derivatives with respect to coefficients α_j ($j = 1,...,n$) be zero. This condition $\delta\Psi/\delta\alpha_j$ ($j = 1,...,n$) yields a system of m integrodifferential equations, a zero sum of m surface integrals, which is solved by seeking ΔW_0 as a series in linearly-independent function ψ_k ($k = 1,...n$. The algorithms of compensation by retouch calculations according to this method have been programmed for an

IBM -PC AT computer, the RETOUCH program consisting of five steps: 1) calculating the profile of axisymmetric and nonaxisymmetric retouch, 2) representing the results in the form of tables and on graphs, 3) evaluating and analyzing the residual aberrations, 4) prediction of the contrast at all points where interferograms have been processed and estimating the effectiveness of retouch, 5) filing the retouch profile in the form of a two-dimensional power polynomial in the INTERF program format. The procedure is demonstrated on a high-resolution objective. Figures 1; tables 1; references 3.

Recognition of Three-Dimensional Objects on Image of Locale

947J0023A St Petersburg OPTICHESKIY ZHURNAL in Russian No. 6, Jun 93 (manuscript received 16 Dec 92) pp 35-40

[Article by A.S. Batrakov, candidate of technical sciences, and V.P. Ivanov, candidate of technical sciences, All-Russian Science Center "State Institute of Optics imeni S.I. Vavilov";UDC 621.397.3:681.3]

[Abstract] Recognition of three-dimensional objects on a perspective image of a real locale is examined, the process involving detection and subsequent identification of an a priori known object on a real image possibly much larger than that object. The basic procedure is to construct a reference image of the sought object and then find the latter on a large image. Inasmuch as it is not otherwise feasible to store reference images covering the entire gamut of conditions (aspect, position of light source, focal length of lens, resolution), automatic recognition by means of three-dimensional computer graphics is being resorted to so that both the locale and the shape of an object can be described mathematically in a form readily yielding quasi-photographic likenesses under practically any conditions. Successful computer-aided simulation of reference images requires storing in the computer memory not the numerous reference images of the sought object but only its shape and optical characteristics, a single reference image then being generated by a synthesizer under predetermined conditions. The procedure is demonstrated on automatic object detection and recognition with the aid of video sensors on an aircraft in flight. For reconstruction of a whole scene, each individual three-dimensional object or group of objects is fictitiously enveloped with a convex polyhedral shell. As an example is considered a hexahedral shell with the base on the ground, the parallel to it roof in the air, and the lateral four other faces of equal height h in vertical position. The calculations are programmed so that the width of the shell will, depending on the sun's position, automatically increase so as to optimally envelop not only the three-dimensional object but also its two-dimensional shadow. For this purpose the computer solves a system of four equations in space coordinates X_i, Y_i of the four base vertices i= 1(1)4 and space coordinates X_{sun}, Y, Z_{sun} of the sun with the height h of the shell given. The algorithm of image synthesis yields first an image of the entire locale without objects in it and then adds zone-by-zone the images of objects, including their shadows and other graphically describable items, each within its fictitious enveloping shell. The algorithm includes also calculation of the image brightness based on information about the brightness of pixels, unless Nyquist's rule is observed and the space frequency of readout from the discretized locale image is accordingly at least twice as high than the spatial discretization frequency of that image. Figures 7, references 5.

Minimum Threshold Temperature Difference Detectable by Infrared Imaging Method

947J0024A St Petersburg OPTICHESKIY ZHURNAL in Russian No. 5, May 93 (manuscript received 5 Oct 92) pp 20-23

r of technical sciences, professor, and M.A. Trishenkov, doctor of technical sciences, Scientific-Industrial Association "Orion", Moscow; UDC 621.384.326]

[Abstract] Minimizing the threshold temperature difference detectable by infrared imaging is considered, the detectable temperature difference being the principal performance characteristic of an infrared receiver and its minimum threshold being theoretically attainable in the absence of atmospheric noise and background interference. The noise equivalent temperature difference (NETD) is represented as the product of three terms containing the radiation wavelength, both focal length and diameter of the objective, the surface area of a photosensitive element, and the photoelectron storage time, also the numerical spectral density of photons emitted by an absolute black body and a parameter characterizing the degeneracy of the photon flux emitted by an absolute black body at a temperature T. It has been assumed here that objects within the field of vision radiate heat as if they were absolute black bodies, that the diameter of the objective is smaller than its focal length, that the infrared imaging device includes a photon receiver with a long-wave sensitivity edge λ_m and a cooled mask preventing incidence of extraneous radiation on the photosensitive surfaces, and that the photosensitive element in each channel is followed by a photoelectron storage device ensuring optimal filtration for extraction of the signal from its mixture with white noise in the background radiation. The dependence of the thus defined noise equivalent temperature difference (NETD) on the long-wave sensitivity edge of the photon receiver is evaluated for an infrared imaging device with a single photosensitive element and with image scanning along both orthogonal axes, assuming that photoelectrons are stored within a time almost equal to the frame period. As the sensitivity edge shifts to longer waves, the specific NETD* first decreases very fast to a minimum (slightly above $5x10^{-8}$ k.cm.$s^{1/2}$ when the sensitivity edge is 28.2 μm and the blackbody temperature is 292 K) and then almost negligibly increases. Fluctuations of the incident radiation flux and nonhomogeneity of the photosensitive surfaces tend to raise the minimum temperature difference detectable by infrared imaging. It is also shown that the information content of infrared images is smaller when the temperature of objects is lower. References 4.

Protecting Surfaces of Optical Devices against Detrimental Biological Agents

947J0025A St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 4, Apr 93 (manuscript received 11 May 91) pp 3-7

[Article by A.A. Baygozhin, doctor of technical sciences, L.N. Kuznetsova, candidate of technical sciences, N.V. Vepritskaya, and V.Yu. Zvereva, All-Russian Science Center "State Institute of Optics imeni S.I. Vavilov"; UDC 666.1.056:620.197]

[Abstract] Studies made concerning protection of optical surfaces against detrimental biological agents, specifically defects caused by fungi, have revealed that conventional volatile fungicides and fungistats do inhibit mold formation on optical glasses, but also either form films of a less transparent condensates on the glass surface or corrode metal parts of the fixtures. A mixture of dimethyl diethoxysilane and antiseptic N- cyclohexyl dichloromaleate in acetone-alcohol solution was proposed in 1985, but later found to be inadequate and also to form a fine-polycrystalline layer rather than a desirable continuous condensate film when exposed to water vapor in the air. While new fungicidal thin coatings are being synthesized, a rational and comprehensive procedure for evaluating their effectiveness is being followed which includes measuring their fungicidal power, spectral characteristics of their optical properties, also their critical contact angle with water and thus their effect on the surface wettability in water. Included are further chemical analysis, mechanical tests, and environmental tests under conditions as severe as a humid subtropical climate. In this way have been and still are being developed bioactive organoelemental compounds for film-forming hydrophobic fungicidal coatings. They must not influence the performance characteristics of an optical device and not corrode its metal parts, they must remain stable during storage at room temperature, must be readily producible and not be a scarce commodity. They must also be ecologically harmless. A technology of producing them in a single process stage has been developed, high-molecular compounds being successfully used for surface modification of optical glasses. Addition of a film-forming $YRSiX_3$ monomer (Y- Hg,Sn, or substitute atom; R- alkyl group; X- hydrolyzable group) and mercury acetate or organostannosiloxane on top of a film-forming polymer of the polyorganosiloxane elastomer (synthetic caoutchoucs) group will ensure long lasting comprehensive protection, owing to cooperative action and effective hydrophobization. Enrichment caoutchouc with OH-groups prior to its deposition on glass will, moreover, strengthen its adhesion to the optical surface. Tables 2; references 9.

Effect of Carrier Dynamics on Performance of Aerial Infrared Imaging Device Operating in Superposition of Images Mode

947J0025B St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 4, Apr 93 (manuscript received 11 May 92) pp 25-28

[Article by R.M. Aleyev, candidate of technical sciences, A.Ye. Morozov, candidate of technical sciences, and V.A. Ovsyannikov, candidate of technical sciences, State Institute of Applied Optics, Kazan; UDC 621.384.326:629.7]

[Abstract] Based on the principles of aerial infrared imaging for explorative survey of natural resources by gapless scanning of the ground surface, the performance of an infrared imaging device carried by an aircraft and operating in the superposition of images mode is analyzed for its dependence on the aircraft pitching and heeling dynamics. An example of such an infrared imaging device is one which includes SPRITE radiation receivers operating with internal integration of signals, which ensures a very high detection power but normal operation within a very narrow range of scanning speeds only. The effectiveness of an infrared imaging device is defined as the angular space frequency ν of the equivalent thermal pattern to be resolved and thus as the reciprocal of its angular resolution, the latter being uniquely and monotonically related to the probability of detecting or recognizing objects on the ground. That angular space frequency can be determined from the temperature-frequency characteristic $Q = \Delta T_R / \Delta T_0 = \psi(x)$ of the infrared imaging device ($x = \psi\delta$; ΔT_R- effective difference between temperature of object and ambient temperature, taking into account the transmissivity of atmospheric air and deviation of the equivalent pattern from the standard one; ΔT_0- temperature difference equivalent to the set noise). Another characteristic needed for evaluating the effectiveness of infrared imaging is the dependence of the threshold m of Q-magnification due to superposition of image rows or frames on the total relative shift between images. The scan cycle period is assumed to be usually much shorter than the periods of angular oscillations of an aircraft about any of its principal axes. It is also assumed that the photodetector noise may have a hyperbolic component. Figures 2; references 6.

Night Telescope NZT-3

947J0025C St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 4, Apr 93 (manuscript received 13 Jul 92) pp 51-53

[Article by A.V. Medvedev, A.V. Grinkevich, M.I. Gundyak, and V.V. Nikoshin, Optics-Mechanical Manufacturing Plant, Rostov; UDC 681.75.015.2]

[Abstract] A new telescope has been developed for night observations at 3-5 mlx background illuminance without brightening. The objective of this NZT-3 telescope consists of seven successively smaller lenses on the main optical axis: convexo-plane first lens; double-convex second lens and double-concave third lens forming a compound pair; double-concave fourth lens; convexo-concave fifth lens and sixth lens; concavo-plane seventh lens. The objective is followed by an electron image converter tube on the same optical axis and the latter by an image erector consisting of four compound lenses on a common optical axis perpendicular to the main one: plano-concave lens and double-convex lens forming first pair; plano-convex lens and double-convex lens forming second pair; convexo-concave lens and double-convex lens forming third pair; double-convex lens and concavo-convex lens forming fourth pair. A rotating plane mirror mounted at a 45° angle to each of the two mutually perpendicular optical axes reflects light emerging from the image converter into the

image erector. A second such mirror parallel to the first one reflects light emerging from the image erector into an ocular consisting of six lenses on a common optical axis perpendicular to the image erector axis and thus parallel to the main one: plano-concave first lens; double-concave second lens and double-convex third lens forming a compound pair; double-convex fourth lens and concavo-convex fifth lens forming a compound pair; convexo-plane sixth lens. The light source enclosed with the telescope is a type-A laser and a beam-forming objective consisting of three lenses of the same size: plane-convex first and third lenses; double-convex second lens touching first lens on the optical axis. The telescope characteristics include a magnification of at least 5.4, a field of vision angle of at least 5°, and a focusing power within (+/-)4 diopters. The telescope has successfully passed all tests, including illumination measurements. It operates with an internal or external 13.5 V electric power supply and weighs 4.5 kg. Figures 3; tables 1; references 3.

Problems in Constructing Efficient Heat Extraction System for Silicon Cryomirrors

947J0028A St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 2, Feb 94 (manuscript received 6 Mar 93) pp 23-29

[Article by A.I. Belyayeva, doctor of physical and mathematical sciences, professor, I.V. Kamyshova, S.A. Pogorelova, V.I. Silayev, candidate of physical and mathematical sciences, V.P. Yuryev, candidate of physical and mathematical sciences, Institute of Low-Temperature Engineering Physics at Ukrainian Academy of Sciences, Kharkov; UDC 681.7.062.536.2]

[Abstract] A method of designing an efficient heat extraction system for silicon cryomirrors under vacuum used in infrared astronomy is outlined, the major constraint being that such mirrors will to operate in a transient temperature field until the cooling from room temperature to a given low temperature below is completed with the temperature gradients on the mirror surface not exceeding permissible magnitudes and the thermal response of a the mirror to changes in heat and other loads not exceeding permissible limits. Conventional conductive cooling is ensured by solid contacts between mirror and heat extractor. The design procedure is based on a thorough experimental study on 53 mm long cylindrical mirrors 45 mm in diameter cut from blanks of cast polycrystalline silicon. Two radial holes 2 mm apart and as deep as the mirror radius were drilled one on the reflecting side and one on the dark side, for insertion of two Cu-constantan thermocouples. The reflecting surface was totally covered by a solid disk of grade-OOb copper under a heater coil with power regulation enabling it to act as an adjustable heat load simulator, large temperature differences across the interface thus also being attainable for measurement of its thermal resistance. Its thermal resistance was minimized by insertion of an indium foil between copper disk and silicon mirror, and by pressing onto the disk a copper plunger of special shape 15 mm in diameter at the contact. The plunger was wrapped in a sleeve of special thermal insulation and to its free other end was soldered-on a 150 mm long heat extracting conductor with a 4 mm large effective diameter. From the results of measurements has been determined the dependence of mirror temperatures, of temperature differences across critical contact zones, and of thermal resistances along the heat path on the length of cooling time. On the basis of these experimental data supplementing the appropriate mathematical model have been developed three versions of a Si-cryomirror cooling system: one with a single heat extracting conductor, one with four such conductors, and one with a copper hoop around the lateral mirror surface. Figures 6; tables 1; references 14.

Doppler Radar for Monitoring Motor Vehicle Moving Through Dust Cloud

947J0028B St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 2, Feb 94 (manuscript received 7 May 93) pp 33-36

[Article by A.P. Narysov, candidate of technical sciences, and V.V. Sadchikov, Scientific-Industrial Association "State Institute of Applied Optics", Kazan; UDC 621.396.962]

[Abstract] Following a review of basic Doppler radar principles applied to detection of moving objects and determination of their velocities by measurement of Doppler reflection spectra, a Doppler radar with an optical rangefinder is described which has been developed and built for monitoring motor vehicles which move through dust clouds. The light source is an LGN-901 CO_2-laser with operating at a power level of about 3 W. Its radiation is stabilized by means of a piezoceramic corrector and a diffraction grating, whereupon a primary plane Cu mirror reflects it at a 90° angle onto a Ge plate for splitting into an object beam and a reference beam. The object beam is twice reflected upon 45° incidence on two successive plane mirrors, for passage along a parallel path through a diaphragm into a collimating lens which reduces its divergence to one eighth of the original. The collimated beam, 40 mm in diameter with a 0.6 mrad divergence angle, is then reflected by a plane scanning mirror onto the road under observation, whereupon a part of the returning beam is reflected by the same scanning mirror into a receiving objective coaxial with the collimator and operating in the Cassagrain mode. The objective lens has a 1000 mm focal length and a 200 mm outside diameter, its 110 mm inside diameter being larger than that of the collimating lens. The objective focuses the incoming radiation on the diffraction spot on the 0.2x0.2 mm^2 large light-sensitive surface of a HgCdTe photodetector, a high-speed photodiode with a 30 MHz wide passband. The reference beam meanwhile passes through two successive acoustooptic modulators operating at close to one another frequencies (40 MHz and 39.6 MHz) and then, after reflection by another plane mirror, through the receiving objective to the photodiode. For automatic frequency control another photodetector, a photoresistor with 1x1 mm^2 large light-sensitive surface and a 1 MHz wide passband, is placed at the entrance to the laser. Such a configuration of the optical system enables the radar set to operate in the energy mode and in the heterodyne mode without additional tuning. Use of two modulators significantly weakens the effect of direct illumination at the carrier frequency in the reference channel. The radar is calibrated against a foam plastic panel set into 50 Hz vibration by a 10GD-30 loudspeaker head. Figures 2; references 2.

Principles of Designing Technical Sighting System for Prevention of Railroad Train Collisions

947J0028C St. Peterburg OPTICHESKIY ZHURNAL in Russian No. 2, Feb 94 (manuscript received 2 Feb 93) pp 58-62

[Article by I.A. Machtovoy, candidate of technical sciences, and A.S. Mikheyev, candidate of technical sciences, All-Russian Science Center at State Institute of Optics imeni S.I. Vavilov; UDC 681.327.12.001]

[Abstract] A technical sighting system for prevention of railroad train collisions is being designed, a major role being assigned to semaphores. Its three basic tasks are to detect objects (obstacles), to identify them, and to decode their encoded position. A telephoto camera with an optoelectronic receiver of semaphore lights feeds images to a detector (image converter). The latter sends signals to: 1. an object identifier followed by a semaphore lights color analyzer, 2. a stereorangefinder, 3. a path analyzer. A generator of brake activation signals, upon receiving signals from these three sources, transmits an output signal to the brake servomechanism. The stereorangefinder and the tracking device are interfaced, the latter sending signals to a light source for the road. In the stereorangefinder a right prism with mirror faces is placed symmetrically between two terminal reflectors of incident light. This prism combines the light coming from both reflectors into a single beam and sends that beam through an intensity regulator into an objective followed successively by a focus magnifier and a beam splitter. Two hoods, one around each reflector, prevent entry of sunlight or the headlight beam of a train into the system. The spectral sensitivity band of the system is 0.45-0.90 μm, which covers both visible and near infrared light so that the system can respond to semaphore lights of all three colors: green (0.51-0.55 μm) - yellow (0.57-0.59 μm) - red (0.62-0.78 μm) semaphore lights. Object-obstacle identification is based on geometrical characteristics. The color of a semaphore light is identified by spectral discrimination. The path analyzer has an autointerrogator with an exclusive-NOR gate, and a decoder followed successively by a comparator, a memory, and an autoresponder. Figures 4; references 3.

Goniometer for Studying Reflection Characteristics of Objects

947J0028D St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 2, Feb 94 (manuscript received 17 May 93) pp 75-78

[Article by S.M. Veperentsev, V.G. Gorosh, N.N. Kopylov, candidate of chemical sciences, and G.K. Kholopov, candidate of technical sciences, Scientific-Industrial Association "State Institute of Applied Optics", Kazan; UDC 681.785.63]

[Abstract] A laboratory goniometer has been developed and built by the authors for studying the spatial reflection patterns of particularly three- dimensional objects but also of predominantly diffusely reflecting objects. Its optical system includes an illuminator with a 30 V - 300 W (stabilized) incandescent lamp and a photometer with a photomultiplier tube, the optical axes of their respective objectives intersecting at an angle α at a point 0.6 m equidistant from both. The object is placed with its geometrical center at that point of intersection. Two sets of diaphragms are provided, one with 1-5 mm diameters to be placed in the focal plane of the illuminator objective and with 3-12 mm diameters to be placed in the focal plane of the photometer objective. The object is placed with its geometrical center at that point of intersection. Two light absorbers, each in the form of a sheave with a set of black-coated 30° V-grooves, are placed 0.6 m behind the object: one diametrically opposite the illuminator aperture so as to completely cover the collimated light beam after its passage through the object and one diametrically opposite the photometer aperture so as to completely cover its field of view. The object is oriented and rotated by means of a device with DVSh80-06 stepper motors and three degrees of freedom. Two degrees of freedom are with respect to two orthogonal axes: rotation about one through any angle within the full $0° \leq \varphi \leq 360°$ range and about the other through any angle within the $-88° \leq \theta \leq +90°$ range. The third degree of freedom is added by rotation of the photometer axis about the illuminator axis through any angle within the the $-22° \leq \psi \leq 180°$ range. Within the interference zone on the illuminator and photometer side the range of φ angles is narrower, depending on both α and ψ angles. Goniometer control as well as signal recording and processing, including digital-to-analog conversion, are automated with the aid of a personal IBM PC-XT type computer which executes the operations according to a given program and displays the results on the screen of a SETU-10 multipurpose monitor. In this way was, for instance, tested a conical body. The dependence of its effective reflecting surface area on its orientation angle φ relative to the illuminator axis was measured with its position around the photometer axis at angle $\theta = 0°$, the position of the photometer axis at around the illuminator axis at angle $\psi = 90°$, and with three different angular distances between the two axes: $\alpha = 25°, 90°, 132°$. The main sources of possible errors are: nonuniform luminance distribution over the light beam cross-section and nonuniform sensitivity distribution over the photometer field of view, instability of both distributions, nonlinearity of photometer components, ambiguity of object position angles due to inaccurate initial setup and backlash in the drive mechanism. The relative mean-square error is, however, not likely to exceed 15 % (20 % in speckle photometry) and the object position angles can be measured accurately within 45' relative to both object and photometer rotation axes. Figures 3; references 5.

Cryooptical Systems

947J0029A St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 1, Jan 94 (manuscript received 22 Jun 93) pp 71-75

[Article by G.S. Goryankin, candidate of technical sciences, laboratory chief, R.N. Denisov, candidate of technical sciences, department head, B.A. Yermakov, doctor of technical sciences, general director, V.A. Markin, candidate of technical sciences, deputy department head, L.Sh. Oleinikov, candidate of technical sciences, director of laboratory for cryooptics and cryogenic applications in optoelectronic devices, and V.I. Ostanin, candidate of technical sciences, chief scientific associate, All-Russian

Science Center at the State Institute of Optics imeni S.I. Vavilov; UDC 621.383.4.3.029.71/73:520.224.4]

[Abstract] Cryogenically cooled infrared devices with small pupil have excellent characteristics suitable for space research, especially a sensitivity higher than that of large optical terrestrial telescopes, but require low background noise levels. The essential requirements are: field of view ranging from tenths of angular minutes to several angular degrees, angular resolution ranging from fractions of a minute to tenths of minutes, spectral range from 2 μm to beyond 100 μm and thus beyond the window in the earth's atmosphere, diameter of lens or mirror ranging from 100 mm to 1000 mm, photosensitivity within the 10-0.1 aW/cm^2 range, number of objects detectable during one observation ranging from a hundred to a million, usability for an observation time ranging from tens of a minute to one year, and 10-90° width of Sun, Earth, Moon containing sectors. As far as photodetectors for such infrared telescopes are concerned, the design problems have already been thoroughly analyzed and completely solved. One of them is selection of semiconductor materials for the photoresistors which will ensure minimum generation-recombination noise at specific wavelengths of incident radiation: Ge:Hg for 13 μm, Si:Ga for 16 μm, Si:As or Ge:Cd for 22 μm, Si:B for 30 μm. The topology of such low-noise photodetectors and the dimension of their "elongated" elements contribute to high accuracy of angle and radiation measurements. The optoelectronic devices for infrared telescopes must be cooled to various appropriate temperature levels within the 4-77 K range, so as to minimize the heat load at those levels. The cryogenic IKON infrared telescope for the "IK-Obzor" (IR Field of View) experiment operates with its objective at ≤ 30 K and its radiation receivers at ≤ 16 K. The objective, 150 mm in diameter, has a 5 foot field of view and a 2 inch or 3 inch angular resolution. The telescope has 128 sensitive elements, all 150 μm large, for operation within three respectively 7 μm, 11 μm, 14 μm wide spectral bands. The storage time is 0.1 and the mean-square error of angle measurements is 20 inches. One problem not yet solved is adequate protection against contaminants such as condensates of surrounding gases. Figures 2; tables 2; references 12.

Optical Mirrors Made of Nonconventional Materials

947J0029B St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 1, Jan 94 (manuscript received 17 Sep 93) pp 76-83

[Article by S.V. Dyubarskiy, candidate of physical and mathematical sciences, scientific director, Department of Optical Mirrors and Nonconventional Materials, and Yu.P. Khimich, candidate of physical and mathematical sciences, chief of laboratory for nonconventional optical materials, All-Russian Science Center at State Institute of Optics imeni S.I. Vavilov; UDC 681.7.062:681.7.03]

[Abstract] Research done on optical mirrors made of nonconventional materials for telescopes and lasers is reviewed, the aim having been highest possible precision for optimizing the image quality and minimizing the beam divergence by limiting the diffraction. The scientific-technical research program included:

1. construction of physical and mathematical models for comprehensive design analysis;
2. development and evaluation of promising new materials;
3. theoretical and experimental study of internal sources of dimensional instability;
4. methods of forming diverse optical surfaces, including eccentric aspherical and higher-order aspherical ones, methods producing ultrasmooth surfaces, and methods of joining mirrors to support structures;
5. development and deposition of reflective and protective coatings;
6. means and methods of continuous inspection throughout the manufacturing and testing cycle.

The only way to maximize the thermal stability of mirrors made of conventional materials is to minimize their coefficient α of linear thermal expansion. The three conventional new mirror materials ULE doped-fused quartz (developed in the U.S.A.), Cerodur (developed in Germany), and Sitall glass-ceramic (developed in Russia) are inadequate in this respect, because they remain stable only within narrow temperature ranges. Considering, however, that the thermal strain under quasi-steady (slowly varying) conditions is determined also by the thermal conductivity λ of the material (namely the α/λ ratio), metallic materials (beryllium, aluminum alloys, copper alloys) and nonmetallic ones (Si, SiC) have been added to the list, especially since their critical mechanical properties are either superior (modulus of elasticity E) or comparable (E/k ratio, k-stiffness coefficient). Also composite materials are considered, mirrors made of the SiC-Si composite material combining light weight with high stiffness. A new technology has been developed for manufacturing mirrors with a structural-grade glass coating on a metal substrate, the expansion coefficients of the two materials necessarily matching. The technology ensures that the glass coating is sufficiently hard and chemically stable, that its softening temperature is sufficiently high and no crystallization occurs, and that the adhesion of glass to metal is sufficiently strong. The technology includes deposition of 3-5 mm thick glass plates on the metal surface, followed by a heating-soaking-cooling process according to a specific temperature-time cycle. Such mirrors up to 1200 n.m in diameter have already been built and withstood temperatures down to -60°C without fracture of the coating. Special polishing and diamond grinding processes have been developed which reduces the roughness of metal surfaces to within 2-3 nm and 4-5 nm respectively, as measured with a contact profilometer or on the basis of integral light scattering. Also other reflective and protective coatings have also been developed: a multilayer dielectric on metal mirrors for 0.308 μm or 1.064 μm radiation, and metal-dielectric ones on mirrors for 5.1 μm or 10.6 μm radiation. Another aim is reducing the weight of large mirrors, the first generation of light-weight mirrors with glass on beryllium up to 1200 mm in diameter having been built in 1985. These mirrors have an asphericity not

exceeding 180 μm and a mean-square form deviation in 0.63 μm light not exceeding 0.02 (plane and sphere) and 0.1 (higher- order asphericity). Their relative aperture is 1:5 and their reflection coefficient is 0.92 for visible light, 0.96 for near-infrared light, 0.93 for far-infrared light. For cryogenic telescopes used in astronomy are considered highly isotropic and technological low-cost mirrors made of aluminum alloys with protective coatings which can be cleaned by conventional methods. For optical cavities of technological lasers are being developed mirrors up to 1000 mm in diameter with reflective and protective coatings on ultrasmooth surfaces, suitable for both continuous-wave and pulse-repetition modes of operation at power levels up to 200 kW, multilayer compound mirrors with cooling as well as monolithic mirrors without cooling. Tables 3; references 2.

Simulation of High-Energy Physical Processes With Aid of Multitarget Laser Sets

947J0029C St.Peterburg OPTICHESKIY ZHURNAL in Russian No. 1, Jan 94 (manuscript received 17 Sep 93) pp 84-94

[Article by Yu.A. Rezunkov, candidate of technical sciences, department head, V.S. Sirazetdinov, candidate of technical sciences, manager of test stand for adaptive laser systems, A.V. Charukhchev, candidate of technical sciences, chief of power lasers laboratory, D.L. Starikov, doctor of physical and mathematical sciences, director, Scientific Research Institute of Comprehensive Optoelectronic Devices and Systems Testing, All-Russian Science Center at State Institute of Optics imeni S.I. Vavilov; UDC 621.373.826.038]

[Abstract] Power lasers with widely variable characteristics have been built to serve as high-energy hyperdirectional radiation sources, as sources of luminous energy to be transmitted over long distances with minimum loss and to be received with subdiffractional precision. One of the largest research stands built at the Institute of Optics during the past 15 years is the 6-channel "Progress," intended for the study of intense radiation and spherical target interaction relating to laser-induced thermonuclear fusion. It includes a Nd-glass master laser emitting pulses of up to 1.5 kJ energy and about 1 ns duration or a power of 3.5 TW in pulses of 0.1 ns duration. It also includes a chirp-pulse generator with a regenerative amplifier and a shaping-pulse generator, both feeding a common preamplifier with two inputs and three outputs. Pulses from one output pass through a compressor to the target inside a spherical chamber. Pulses from the other two outputs pass through a separator to a module which contains: a series of bar and disk amplifiers with successively larger (30 mm to 110 mm) apertures with vacuum-type spatial filters separating the amplifiers and preventing self-action, electrooptical deflectors, electrooptical (Pockels) shutters and magnetooptical (Faraday) shutters decoupling the laser from targets, and harmonic filters. From here pulses proceed along six channels to six targets. Some pulses are deflected through an amplifier with a 140 mm aperture to two detectors with 150 mm and 250 mm apertures respectively. Some pulses are diverted to another compressor. This stand was used in experiments with pulse compression during stimulated Mandelshtam-Brillouin scattering. For generating and amplifying ultrashort chirp pulses of only 1 mJ energy and 0.2-1.0 ns within a 2-4 nm spectral, a very inefficient Nd-glass laser is replaced with a mode-locked YAG:Nd^{+3} laser emitting continuous sequences of pulses of 50 ps duration at a repetition rate of 100 MHz within a 0.2 nm wide spectral band. Chirp pulses of 0.15-0.6 ns duration are formed in single-mode fiber optics, where phase modulation and group velocity dispersion broaden the spectrum and elongate a pulse. Additional elongation of a pulse takes place in a lattice-type stretcher. Extraction of a pulse is effected by the electrooptical shutters, which are controlled by photoelectric switches. The regenerative amplifier then puts out a pulse of about 1 mJ energy, sufficient for transmission to the main amplifier channel with a 110 mm exit aperture. A second large research stand is the "LAS", which includes an Nd-glass laser with phase conjugation and a 110 mm output aperture. It emits pulses of up to 500 J and 25 ns duration in a beam with a divergence angle of 5 μrad so that the axial radiation intensity reaches 80 aW/cm^2. A third large research stand is the "Chibis", which includes a CO_2-laser operation in the pulse-repetition mode. Experiments with this apparatus have demonstrated the feasibility of a focusing-deflecting system which uses large compound mirrors and of compensating its aberrations by means of phase conjugation. Figures 6; references 30

Detection of Trace Contents of Toxic Metals in Samples of Polar Ice and Snow by Laser Atomic Fluorescence Spectrometry Method

947J0036A Moscow OPTIKA I SPEKTROSKOPIYA in Russian Vol. 76 No. 2, Feb 94 (manuscript received 14 Sep 93) pp 237-241

[Article by M. A. Bolshov, V. G. Koloshnikov, S. N. Rudnev and C. F. Boutron, Spectroscopy Institute, Russian Academy of Sciences, Troitsk; Laboratoire de Glaciologie et Geophysique de l'Environment du CNRS, Domaine Universitaire, Paris; UDC 535.331:621.373.535]

[Abstract] The ultrasensitive laser atomic fluorescence spectroscopy (LAFS) method was used in direct determination of the content of Pb, Cd and Bi in samples of deep layers of ice from Antarctica and Greenland. The work was done in collaboration with French scientists from the LGGE at Grenoble. The LAFAS-1 spectrometer, in which the source of resonance radiation is a dye laser excited by the radiation of an excimer XeCl laser, was used. The spectrometer is fully described in the literature and briefly in this article. The sampling method and method for preparing the samples are described in detail. Ice cylinders 6-10 cm in diameter and 15-30 cm high were extracted. There was excellent agreement between the results of Pb and Cd measurements made by the LAFS method and the two classical methods. However, the sensitivity of the LAFS method is several orders of magnitude greater than the other methods. With the LAFAS-1 all three elements were measured with sample volumes 20μm (Pb) and 50 μm (Cd, Bi). In the traditional method a much longer time was required in the sampling and the samples had to be much

larger. There are three principal sources of entry of heavy metals into the atmosphere: wind erosion of the soil surface, volcanic ejecta and microspray from the ocean surface. The contribution of different sources is examined in detail in the example of Pb. Figures 2; references 21: 20 Russian, 1 Western.

Efficiency of Airborne Thermal Imagers in Monitoring Pipelines for Petroleum and Petroleum Products

947J0039A St. Petersburg OPTICHESKIY ZHURNAL in Russian No. 1, Jan 93 (manuscript received 17 Mar 92) pp 6-8

[Article by R. M. Aleyev, candidate of technical sciences, V. A. Ovsyannikov, candidate of technical sciences, State Institute of Applied Optics, Kazan, and V. N. Chepurskiy, Administration of Main Petroleum Pipelines, Tyumen; UDC 621.384.326]

[Abstract] Formulas are derived for computing the probability of detecting thermal anomalies arising when there is leakage from gas and oil pipelines. At least 100 such accidents occur in Russia annually and the number is expected to increase. The key parameters of the thermal anomalies (ΔT_R, S) arising with escape of the product from a pipeline and ambient inhomogeneities (ΔT_{back}) were studied in key sectors of the Ural-Siberian gas pipeline during summer, autumn and winter under different meteorological conditions (clear, cloudy, rain, snow) with simulation of leakage of the product into the atmosphere, in the ground at different depths, into snow and into the ground beneath snow. Observations were made at altitudes 0.05...0.2 km in the spectral range 8-14 μm with registry by a specially developed helicopter-borne thermal imager, whose principal technical specifications were optimized, outfitted with a device for measuring the difference ΔT_R. The behavior of these parameters as a function of many other variables (including helicopter speed and altitude) was ascertained. For example, the maximum level of background radiation temperature fluctuations ΔT_{back} is dependent on season and prevailing meteorological conditions: 3 K (summer, daytime, clear), 1 K (summer, daytime, cloudy), 2 K (winter, daytime, clear), 0.5 K (winter, daytime, cloudy). Such measurements are illustrated in the example of several thermal anomalies arising during real leaks into snow-covered ground. Figure 1; references 2: 1 Russian, 1 Western.

Layers Containing Heavy Hydrogen Isotopes in Targets for Laser Thermonuclear Fusion

947J0035A Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol. 21 No. 2, Feb 94 (manuscript received 26 Jul 93) pp 155-157

[Article by Yu. A. Abramov, A. V. Bessarab, A. V. Veselov, P. I. Gavrilov, A. A. Druzhinin, V. M. Izgorodin, T. V. Karelskaya, G. A. Kirillov, G. V. Komleva, G. A. Lyamin, G. P. Nikolayev, A. V. Pinegin, V. T. Punin, K. G. Rabinovich, V. N. Romayev, V. G. Rogachev, Ye. Yu. Solomatina, N. N. Tarasova, G. V. Tachayev, V. V. Andryushin, S. A. Yemelyanov, V. B. Kryuchenkov, N. N. Markelov, Yu. Ye. Markushkin and N. A. Chirin, All-Russian Experimental Physics Scientific Research Institute, Arzamas-16, Nizhegorod Oblast; All-Russian Technical Physics Scientific Research Institute, Chelyabinsk-70, All-Russian Scientific Research Institute of Inorganic Materials imeni A. A. Bochvar, Moscow]

[Abstract] In developing thermonuclear targets with a positive energy yield it is customary to examine a case when the deuterium and tritium are present in the target in a condensed state. Such targets are used in laser thermonuclear fusion experiments at the Iskra-4 and Iskra-5 facilities. The material used for the coatings is liquid and solid deuterium or a deuterium-tritium mixture, as well as beryllium and titanium hydrides and polyethylene containing deuterium and tritium. An annotated diagram of the cryogenic unit for preparing a target in the interaction chamber is given. The technology for preparing cryogenic targets and their installation in the interaction chamber is fully explained in the text. This technology is similar to that developed in the United States (such as D. L. Musinski, et al., APPL. PHYS. LETTS, 34, 300, 1979). The method makes it possible to obtain a cryogenic target 100-300 μm in diameter and 0.5-2 μm thick. Details of the method are given. For example, the behavior of the cryolayer was registered by a motion picture survey of the shadow pattern or interferogram; holographic interferometry was used for more precise measurements of the thickness and uniformity of the cryolayer. Additional information is given on the procedures for controlling and monitoring the parameters and behavior of the layer. Figures 7; references 15: 13 Russian, 2 Western.

Paralleling in Computer Tomography Problems

947G0021 Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No. 1, Jan 94 (manuscript received 1 Mar 93) pp 181-185

[Article by Ye. G. Sukhov, Institute of Control Problems, Moscow; UDC 681.3:61]

[Abstract] Computer tomography problems place high demands on computing equipment. Regularization methods must be used; consequently, matrix algorithms must first be developed. Cellular methods may be advantageously used to solve large linear algebra problems on parallel computers by recursively decomposing the matrix problem and taking advantage of computer features. This paper studies the applicability of cellular methods in two-dimensional linear computer tomography. The image is represented by a square symmetric matrix of order n, which determines the resolution. A cellular-triangular SIMD computer with numerous processor modules with a small amount of local memory and a moderate amount of common memory may be used to solve the problem. The entire system can be controlled with a single program in special computer memory. Another way of solving the problem is to invoke control from a host machine, typically a PC. The first solution is suitable for tomography, the second for design work. References 5 (Russian).

Effectiveness of Fourier, Hartley and Walsh Spectral Transforms in Algorithms To Compress Digital Speech Signals

947G0023 Riga AVTOMATIKA I VYCHISLITELNAYA TEKHNIKA in Russian No. 1, Jan 94-Feb 94 (manuscript received 1 Jun 93) pp 65-69

[Article by G. V. Kuznetsov; UDC 519.717:621.39:534.782.001]

[Abstract] Pulse-code modulated and delta-modulated signals are used to represent speech signals. The Fourier spectra of pulse-code modulated signals were analyzed; Hartley spectra were also considered. The spectra were divided into frequency ranges, or spectral coefficients. Three spectra types were isolated: those with almost all energy at low frequencies, mixed spectra, and those with most energy in the high-frequency range. The number of coefficients which can be transmitted in one frame is determined. Methods of decreasing the initial number of coefficients are described. A graph of the signal compression algorithm is presented. An algorithm is developed to compress a delta-modulated speech signal: an Adamar-ordering algorithm is used to represent a delta-modulated signal in the form of coefficients expanded into a system of orthogonal Walsh functions. The minimum number of spectral coefficients is determined for which analog signal quality is not worsened. Vector quantization and orthogonal Fourier, Hartley, and Walsh transforms were found to be effective in compressing pulse-code-modulated and delta-modulated speech signals. The algorithm used to determine the optimal code size is described, and the results are discussed. Optimal transmission speeds are found to be 2.3-2.5 kb/s for delta modulation and 4.6-4.8 kb/s for pulse-code modulation. Figures 4; references 4 (Russian).

Computer Technology of Creating Digital Terrain Models Using Aerospace Photos

947G0024 Moscow GEODEZIYA I KARTOGRAFIYA in Russian No. 12, Dec 93 pp 49-53

[Article by G. V. Barabin, V. I. Vershinin, V. G. Yelyushkin, L. I. Yablonskiy; UDC 528.711.18:[681.3:516]

[Abstract] Automated terrain analysis requires reliable detailed information on the spatial position and relative heights of objects in digital form. Currently, this is done with photogrammetric processing of stereoscopic large-scale aerial photographs. This, however, is slow. A computer method of creating digital terrain models has been developed which uses individual large-scale space and aerial photographs, digital topographical maps, or large-scale topographical maps. The system uses an IBM-AT PC with a half-tone scanner. Single-exposure, panoramic, and infrared aerospace images may be used. The article examines the following steps in the process: preparatory work; photo scanning with a half-tone scanner; formation of a digital relief matrix; acquisition of the coordinates of reference points in the coordinate systems of the photo and the terrain; photographic resection; photo digitizing; photographic intersection; determination of the relative heights of objects; and formation of the digital terrain model. The resultant models are highly accurate, detailed, and reliable. References 3 (Russian).

Fractal Properties of Controlled Object Dynamics

947G0026A Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No. 2, Feb 94 (manuscript received 22 Dec 92) pp 59-67

[Article by M. M. Khasanov, Ufim Oil Institute; UDC 519.718]

[Abstract] Random vibrations in technical systems may provide information on an object or its internal characteristics. Estimates of the dimensions of attractors and fractal properties of chaotic time series of observations may be used to identify motion in dynamic systems, and may diagnose changes in their states. Separation of true chaos from system noise is discussed. Examples from the field of oil and gas extraction are presented which illustrate the possibility of using these charateristics to monitor and control technological proesses using data obtained in the course of normal operations. It is shown that this information may be used to increase operational efficiency and extend the lifetime of equipment. Figures 4; table 1; references 13 (Russian).

Set-Theoretical Approach to Classification of Statistical Classes

947G0026B Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No. 2, Feb 94 (manuscript received 24 Nov 92) pp 78-87

[Article by A. G. Bronevich, A N. Karkishchenko, Taganrog Radiotechnical Institute; UDC 519.237.8]

[Abstract] This paper examines rather complex statistical objects, random processes characterized by their own probability dis ributions. The objects are formalized using

the concept of a statistical class, which is introduced in this article. The main vehicle for describing statistical classes is level sets. These sets are defined by set-theoretical operations on statistical classes, in particular, measures of mutual inclusion and equality of arbitrary classes. Many properties of level sets are studied in the first part of the article. It is shown that a group of these sets can be used to define a statistical class. Operations on statistical classes are a natural extension of operations on level sets. The link between level sets and the traditional axiomatic theory of fuzzy sets is described. The set of minimal events, described in this paper, leads to the representation of a statistical class in the form of a fuzzy set. The link between fuzzy sets and probability distributions is established. The measures of inclusion and equality used for statistical classes can be transferred to arbitrary fuzzy sets, and more importantly, to fuzzy intervals and numbers. However, not every fuzzy set corresponds to a statistical class, and this is an issue that must still be addressed. References 6: 4 Russian, 2 Western.

Complexity of Sequential Implementation of Cellular Automata Mappings

947G0026C Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No. 2, Feb 94 (manuscript received 14 Jan 93) pp 149-160

[Article by A. I. Adamatskiy, St. Petersburg State University; UDC 519.713]

[Abstract] Cellular automata are discrete mathematical models of multi-component natural and artificial systems consisting of a large number of relatively simple elements linked locally into regular structures. Cellular automata may be applied to parallel asynchronous computation or image processing. This article examines an algorithm to model multi-dimensional deterministic finite asynchronous cellular automata with memory in a Turing machine with one-dimensional tapes (Turing machines without memory are also considered). Turing machines are classical devices for evaluating the complexity of calculations. Estimates are obtained for the spatial and temporal complexity of modeling. It is found that the number of cell states, the size of the vicinity around a cell used to determine its state, the amount of memory, and the maximum delay as a cell changes from one state to another are either constant or vary insignificantly as the number of cells increases. Formulas are presented which are useful in evaluating the complexity of modeling asynchronous cellular automata with memory. Examples of the modeling of multi-component systems are presented. The case of a network of cellular automata is considered. Figures 8; references 16: 8 Russian, 8 Western.

Asymptotic Analysis of an Inhomogeneous Network Model of Multiprocessor and Multi-Terminal Systems

947G0026D Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No. 2, Feb 94 (manuscript received 6 Apr 93) pp 161-171

[Article by A. I. Lyakhov, Institute of Control Problems; UDC 689.324:519.248]

[Abstract] This article examines and analyzes a closed exponential network of queues of large dimension with several classes of calls. This network, which includes finite sources of calls of every class and a set of one-channel devices, is a generalized model of inhomogeneous multiprocessor systems with a completely connected interface, as well as a generalized model of multiterminal systems with external memory. The Laplace method is used to prove a system of assertions which define and validate asymptotic approximations for basic stationary characteristics of the model for a rather broad set of cases of load distributions among the servicing devices in the network. This is in contrast to previous papers where asymptotic approximations with a predetermined accuracy were obtained only for cases of a single class of calls or a small load on all (finite) one-channel devices. The simple form of the approximations makes it possible to guarantee accuracy and quickly obtain a solution to the problem of evaluating the performance of multiprocessor and multiterminal systems. Figure 1; references 20: 11 Russian, 6 Western.

Sequential-Parallel Automated Design of Complex Technical Objects

947G0026E Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No. 2, Feb 94 (manuscript received 1 Mar 93) pp 172-189

[Article by E. A. Trakhtengerts, Institute of Control Problems, Moscow; UDC 62-50:658.512]

[Abstract] This paper gives a general overview of the use of computers in the design of multi-component systems. The article begins by describing the concept of computerized teleconferencing, where all participants see the same thing on their screens and can act on it while communicating in real time. It is noted that collaborations of researchers are no longer limited by geography, and that international collaborations are becoming more and more common. The problem of evaluating the complexity of a task is discussed. Breaking down a project into parts which can be worked on by different teams speeds the design process, as does the use of expert systems. Limits on the number of designers and workstations require coordination of resources and efforts. A flow chart shows how work can be organized. The process of limiting the number of variants to examine and selecting the best variant is described mathematically. Integration of components and selection of optimal designs from the point of view of integrating them with other components are addressed. Basic concepts involved in the design and construction of a network for designers are outlined, as well as the connection of separate networks with gateways or by uniting them into one network. Multitasking and servers are described. Figures 5; tables 4; references 6: 4 Russian, 2 Western.

MIS and Bipolar Transistor Models for LSI Circuit Design Calculations Considering Radiation Effects

947K0082A Moscow MIKROELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 6 Jun 93) pp 21-33

[Article by K. O. Petrosyants, I. A. Kharitonov, Moscow State Institute of Electronics and Mathematics (Technical University); UDC 621.382]

[Abstract] A modified model of a MIS transistor is developed which, in contrast to standard models, provides a continuous description of the volt-ampere characteristic, providing a more accurate model of analog circuits operating in pre-threshold mode. The slope and displacement of model pre-threshold characteristics is determined by induced charges which reflect physical processes in the irradiated structure. A new method of determining threshold voltages and current from measured volt-ampere characteristics is proposed. Compared to the method which determines threshold voltage at a constant current, this method more accurately describes the volt-ampere characteristic of irradiated transistors in weak inversion mode. The standard model of a bipolar transistor is supplemented with recombination components of the base current that arise in various areas of the structure. Each recombination component is unambiguously physically linked with the electrophysical parameters of the semiconductor structure, the geometric dimensions, and the radiation dose. Consequently, the new model can rather easily evaluate various design variants of transistor structures from the point of view of radiation resistance. Software has been developed to determine model parameters and radiation coefficients for this model. Figures 8; references 24: 4 Russian, 20 Western.

Threshold Voltage of Onset of Negative Differential Conductivity in Thin Film GaAs Structures with a Schottky Barrier

947K0082B Moscow MIKROELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 27 Jan 93) pp 42-47

[Article by N. B. Gorev, Ye. F. Prokhorov, A. T. Ukolov, Institute of Technical Mechanics, Ukrainian Academy of Sciences; UDC 621.3821]

[Abstract] The threshold voltage of the onset of negative differential conductivity is studied in a thin film n-GaAs structure with a Schottky barrier and with a semi-insulated compensated substrate. When the Schottky barrier depletion region is adjacent to the film-substrate junction depletion region, as cut-off voltage increases at the barrier there is not the usual decrease in the threshold voltage of the onset of negative differential conductivity, but an increase. This is because the voltage at the gate increases with the ratio of the longitudinal field at the drain end of the gate to the longitudinal field at the source end (the distribution of the longitudinal field becomes more homogeneous). Figures 2; references 4 (Russian).

Silicon MIS Structures with Disprosium and Lutetium Oxides and Rare-Earth Element Diffusion in Silicon

947K0082C Moscow MIKROELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 5 May 93) pp 48-53

[Article by N. V. Latukhina, V. A. Rozhkov, N. N. Romanenko, Samara State University; UDC 621.382]

[Abstract] This article presents a study of the electrophysical properties of silicon MIS structures with dielectric films of disprosium and lutetium oxides manufactured with high-temperature (1323-1593 K) oxidation of rare-earth metal films. Rare-earth metal oxide films have a specific resistance on the order of 10^{17} O cm, a large specific capacitance ($3X10^4$-$3.6X10^4$ pF/cm^2), small dielectric loss tangents ($0.4X10^{-3}$-$5X10^{-3}$) and a high electric strength ($2X10^6$-$4X10^6$ V/cm). The volt-capacitance characteristics method shows that the MIS structures, compared to thermal silicon dioxide structures, have a substantially lower built-in fixed charge in the dielectric, and have a large breakdown voltage. The dependence of depth of bedding of the p-n junction on diffusion time of disprosium into silicon is determined at various diffusion temperatures. The depth of bedding increases nonlinearly as the time and temperature of diffusion increases, and this figure varies from 0.5 to 2.5 μm. Diffusion coefficients are determined for disprosium and lutetium atoms in single crystal silicon. Diffusion coefficients increase from $3X10^{-13}$ to 10^{-11} and from 10^{-12} to $4.2X10^{-12}$ cm^2/s as temperature increases from 1373 to 1593K for disprosium and lutetium respectively. MIS structures with rare-earth metal oxide films have a positive fixed charge in the dielectric which is a factor of 4-7 lower than in thermal silicon dioxide structures. Figures 4; tables 2; references 5: 4 Russian, 1 Western.

Electric Modeling of Thin Film Electroluminescent Capacitors

947K0082D Moscow MIKROELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 22 Feb 93) pp 59-64

[Article by M. K. Samokhvalov, Ulyanov Polytechnical Institute; UDC 621.382]

[Abstract] Previous papers have outlined the basic physical phenomena behind electroluminescent structures and the processes which occur in the luminophore and dielectric layers. However, no electric model of electron processes in the electroluminescent structure of thin film capacitors has been developed. A thin film electroluminescent capacitor consists of a transparent electrode, dielectric, luminophore, dielectric, and opaque electrode on a glass substrate. The electric properties of the luminophore layer are nonlinear. In the equivalent circuit this is modeled with a capacitor with a capacitance equal to the geometric capacitance of the luminophore layer connected in parallel to a nonlinear resistance. The dielectric layer is modeled with capacitors whose capacitances are geometric capacitances of the dielectric film connected in parallel with variable resistors. A full schematic is given in a figure. The real thin film electroluminescent capacitor and the model were

compared. It was found during testing that volt-charge characteristics could be used for quality control. The time dependence of current was determined for a sinusoidal and linearly alternating voltage. The model provides an adequate representation of electron processes in thin film electroluminescent structures.. The model may be modified to represent more complex effects. Figures 3; references 6: 4 Russian, 2 Western.

Optical Transfer Function of a Backlit Photodiode Matrix

947K0082E Moscow MIKROELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 8 Dec 92) pp 86-93

[Article by V. P. Fedosov, Institute of Optico-Neuron Technologies, Russian Academy of Sciences; UDC 621.383-181.48:621.3.049.77]

[Abstract] This article obtains analytical expressions for the optical transfer function of a matrix of backlit photodiodes (a "flip chip"), with a consideration of cross-interactions and the discrete positioning of sensitive matrix elements. A method of solving the problem of converting the spatial frequencies of an optical image with a multi-element photoreceptor matrix is developed. The method is based on construction of an effect function. Figures 2; references 3 (Russian).

Spectral and Correlation Characteristics of Nonlinearly Frequency Modulated Signals

947K0080A Moscow RADIOTEKHNIKA in Russian No. 1, Jan 94 pp 28-31

[Article by A.N. Denisenko and O.A. Stetsenko; UDC 621.391.81]

[Abstract] Both spectral and correlation characteristics of nonlinearly frequency-modulated pulse signals are comprehensively examined, nonlinear rather than linear frequency modulation being necessary for perfect shaping of compressed signals. For specificity are considered a pulse signal $u(t)= \mathrm{Re}\,[U(t)\exp(j\omega_0 t)]$ and power-law frequency modulation $\omega(t)= \omega_d(2|t|/\tau)^p \mathrm{sign}(t)$: t- time, $|t| \leq \tau_i$- pulse duration, $U(t)= U_0\exp(j\psi t)$- complex envelope with amplitude U_0 and phase $\psi(t)$, ω_d- frequency deviation, p- power exponent, sign(t)- sign function. Analytical expressions are derived for the spectral density $S(\omega)$ and the correlation function $R(\tau)$ of such signals. The continuous phase $\psi(t)$ in the expression for the spectral density is approximated is approximated with a piecewise-constant function coinciding at discrete time intervals $\Delta t= \tau_i/2N$ and the phase difference $\psi(t)- \psi(t- \tau)$ in the expression for the correlation function is made approximately equal to $\tau\omega(t)$. For a numerical analysis, $S(\omega)$ and $R(\tau)$ are normalized to S(0) and R(0) respectively. Calculation for $p < 1$ and for $p > 1$ including $p= 1$ confirm that within the $\omega \leq \tau <]_d$ frequency range the signal spectrum is almost uniform when $p= 1$ (linear frequency modulation) and nonuniform when $p < 1$ or $p > 1$, with the maximum spectral density S at frequencies near ω_d when $p < 1$ and near $\omega= 0$ when $p > 1$. The farther p is from 1, moreover, the higher and narrower is the $S(\omega)/S(0)$ peak. Figures 5.

Fast Algorithm of Digital Aperture Synthesis

947K0080B Moscow RADIOTEKHNIKA in Russian No. 1, Jan 94 pp 32-35

[Article by O.Yu. Ivanov, V.G. Kobernichenko, and L.B. Neronskiy; UDC 621.396.96]

[Abstract] A quasi-optimum but fast algorithm is proposed for digital radar aperture synthesis: subdivision of the reference function Ω into M not overlapping time intervals (subapertures) with K readings in each and simplified data processing in each. For specificity is considered formation of a continuous radar image by the method of subframes, namely from $(1 \leq \Delta N \leq N)$ readings taken along the signal path with partial change of information in the memory of the aperture processor after every image forming stroke. For usually small subapertures K and subframes ΔN the the two steps of the algorithm are: 1) formation of M subaperture sums, after phase correction of each input reading; 2) formation of ΔN output readings from the M subaperture sums, after additional phase correction and then another summation. The main advantage of this algorithm over the basic one is that the same and only the same M subaperture sums are used for formation of the ΔN output readings, inasmuch as the weight function included in the reference function remains constant within a subframe. Consequently, in the case of $\Delta N = K$ formation of each new reading for the output image requires only 2^M complex multiplications and additions and thus K/2 times fewer than are required for conventional convolution. The algorithm will be still faster when a fast Fourier transformation is performed during execution of the second step. An analysis of the radiation pattern of an antenna with a thus synthesized aperture indicates that both the width of the major lobe and the height of the first minor lobe are determined principally by the radiation pattern of the array multiplier, which corresponds to a focused antenna of the same dimensions. The radiation pattern of a subaperture remains constant within a subframe and changes by jumps from one subframe to another. Figures 3; references 4.

Improving Mode Self-Filtering in Hollow Waveguides with a Multilayer Magnetodielectric Case

947K0077A Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 5 Jun 92) pp 53-61

[Article by M. V. Davidovich; UDC 621.372.8]

[Abstract] Complex discharge modes of hollow multimode waveguides with a multilayer case are studied with a rigorous electrodynamic method based on joining of field segments and the resultant dispersion equation in a complex plane. The waveguide case is composed of magnetodielectric materials with losses. By varying the thicknesses and permeabilities of the layers and their depth in the case, one can achieve a significant broadband improvement in mode selection at high frequencies. One can also achieve this by reducing losses in the main mode at low frequencies. The figures show run losses of the first few fast modes of a cylindrical multimode dielectric waveguide with a

hollow channel for various configurations of complex permittivities and permeabilities and different numbers of layers. The effect of resonant and nonresonant materials on self-filtering are explained. Figures 6; table 1; references 19: 14 Russian, 5 Western.

Remote Observation of the Development of Thunderstorm Activity

947K0077B Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 22 Dec 92) pp 68-73

[Article by M. S. Aleksandrov, V. A. Yepanechnikov, Yu. V. Kazarov; UDC 621.396.933:551.594]

[Abstract] This paper presents observations of the development of storm activity in the European region of Russia using single-point passive thunderstorm radar. The device has an electric collapsible whip antenna and a magnetic loop antenna, amplifiers, digital recorders for atmospheric phenomena, a small computer, a CAMAC crate, color display, and printer. The range is 300-2000 km. RMS range error is 7-10%, angular error up to 2°. Phenomena are received in the 5-20 kHz range. Readings are taken 1-3 times per minite. Examples of the recording of sources of thunderstorm discharges are presented on a map of the territory under investigation. Activity can be tracked simultaneously over the entire European region of Russia. The results agree with meteorological data obtained at the same time. The studies experimentally demonstrated the ability to evaluate the current thunderstorm situation and the dynamics of storm development in a territory with a radius of up to 2000 km. Figures 5; references 13: 9 Russian, 4 Western.

Determining the Coordinates of Local Inhomogeneities on the Surface of an Object Using a Multi-Frequency Amplitude-Phase Backscatter Pattern with Phase Distortions

947K0077C Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No. 1, Jan 94 (manuscript received 14 Sep 92) pp 81-91

[Article by A. A. Manukyan; UDC 621.396.962.33: 621.391.26]

[Abstract] This paper studies the reverse problem of diffraction for local inhomogeneities rigidly attached to the surface of an object. The method of constructing a two-dimensional radar image is analyzed. The method is based on application of the synthesized aperture method to the development of a packet of broadband signals when one only knows the intensity of the reflected signal. The quality of the resultant image is studied. The limits imposed on the parameters of the discrete signal (to avoid an ambiguous measurement) are formulated. Modeling results are presented. Coherent one-dimensional and two-dimensional portraits are contrasted. Two-dimensional images are found to have a better resolution. Noncoherent images are poorer than coherent ones, as noncoherent images are plagued with false peaks and a decreased signal to noise ratio. Figures 6; references 9: 7 Russian, 2 Western.

AVIATION AND SPACE TECHNOLOGY

Aero-Optical Nozzles of Gas Dynamic Lasers

947F0114A Novosibirsk PRIKLADNAYA MEKHANIKA I TEKHNICHESKAYA FIZIKA in Russian No. 6, Nov-Dec 1993 (manuscript received 30 Aug 92) pp 20-28

[Article by M. G. Ktalkherman, V. M. Malkov, Novosibirsk; UDC 533.697+532.517.4]

[Abstract] In chemical and gas dynamic lasers, phase aberrations form in the resonator cavity on density inhomogeneities in the medium. These inhomogeneities occur in the stream beyond a specific nozzle. The degree of curvature of the two-dimensional edge as radiation passes through the medium determines optical quality. This paper studies the optical quality of the stream beyond flat nozzles typically used in gas dynamic lasers and cellular nozzles used in chemical and gas dynamic lasers. Phase distortions occur in both regular and turbulent structures. The stream in the resonator cavity was sampled with a small diameter beam. The focal point method was used to study the effect of stream features beyond flat and cellular nozzles on the optical quality of the medium. Light scattering occurs in turbulent wakes. Phase changes in the light beam are due to the structure and size of the wakes. Flat nozzles provide no advantage over cellular nozzles for resonators with a stream of around 80 m or greater. Figures 6; references 20: 6 Russian, 14 Western.

Effect of Injector Nozzle Design Parameters for the Model Combustion Chamber of a Liquid-Propellant Rocket Engine on the Generation of Transverse Gas Vibrations

947F0114B Novosibirsk PRIKLADNAYA MEKHANIKA I TEKHNICHESKAYA FIZIKA in Russian No. 6, Nov-Dec 1993 (manuscript received 24 Aug 92; after revision 23 Dec 92) pp 48-57

[Article by B. I. Malinin; UDC 534.28:56.46]

[Abstract] This paper experimentally studies the effect of the design parameters of the injector nozzle of a combustion chamber on the stability of the combustion process with regard to relatively transverse gas vibrations within the chamber. Independent parameters studied individually are: length, diameter, and shape of gas lines, and the transmission rate of the injector nozzle when other design and operating parameters remain unchanged. The transmission rate of the nozzle is the ratio of the total area of the gas lines in the nozzle to the cross sectional area of the cylindrical part of the chamber. The nozzles tested here have ratios of 0.134 and 0.255. Different gas line lengths lead to a significant change in the flow rate at which vibrations occur. The minimum flow rate at the lower edge of the vibration region for both nozzles was virtually the same, given identical line lengths. There are two distinct stability minima in the studied ranges of line length, 48-62 and 156-169 mm. The next minimum is at 250 mm. Maxima are clearly visible at 6-12, 100-120, and 210 mm. The stability of combustion is calculated as a function the Mach number and the ratio of the length of gas lines l to the wavelength of sound in the lines, λ. At the best stability value, minima and maxima are separated by about $0.5l/\lambda$. At the worst stability value, they are separated by $0.25l/\lambda$. This is a key finding of his paper and indicates the acoustic nature of the effect of gas line length. Converging lines have advantages over cylindrical ones. Resonance properties of the nozzle lines are key in determining optimal length. The interaction of longitudinal gas vibrations in the gas lines and transverse (tangential) gas vibrations in the combustion chamber is studied. Figures 8; references 9: 6 Russian, 3 Western.

New Materials and Processes—Prospects for Development and Creation of Aviation Engineering

947F0094A Moscow PROBLEMY MASHINOSTROYENIYA I NADEZHNOSTI MASHIN in Russian No. 2, Mar-Apr 94 (manuscript received 24 Nov 93) pp 3-11

[Article by R.Ye. Shalin, Moscow; UDC 629.7]

[Abstract] Materials now being developed will make it possible to improve the weight efficiency of aircraft and helicopters being built for use in 1995-2010 by 15-20 percent and extend their life by a factor of 1.5. High-strength aluminum alloys of the system Al-Zn-Mg-Cu and medium-strength alloys of the system Al-Cu-Mg are now being developed that will make it possible to produce molded components with strengths up to 540-600 MPa and forged components with strengths up to 450-550 MPa. One area receiving particular attention is that of developing lithium-alloyed aluminum alloys (the alloys 1441 and 1430) with a reduced density (2.58 g/cm^3), increased elasticity modulus, and a 10-20 percent longer life. The weldable structural alloy 1151 is much more heat and corrosion resistant than its foreign counterpart 2219 and is even superior to many nonweldable structural alloys. The process for producing casting aluminum alloys is also being improved. The high-strength alloys VAL12 and VAL14 are stronger than their foreign counterparts and do not contain silver, and their strength should reach 600 MPa by the end of the century. The high-temperature alloys ATsR1U and VAL18 may be used at temperatures up to 540°, and corrosion-resistant and impermeable alloys with respective strengths of 420 and 480 MPa should be available by the year 2000. New strong casting and wrought magnesium alloys have made it possible to dramatically reduce the weight of aviation-related products. Work is under way to create magnesium-based composite alloys reinforced with B, C, and SiC fibers. The Mg-B composite has a density of 2.44 g/cm^3, strength of 1,500 MPa, elasticity modulus of 260 GPa, and ultimate strength of 61.5 km, which makes it significantly stronger than high-strength aluminum, magnesium, and titanium alloys. In the future, these materials will have a strength of 2,000 MPa, elasticity modulus of 300 GPa, and working temperature of 400°. The main goals of research in the area of titanium alloys are to increase specific strength and heat resistance, increase reliability and life, and expand the temperature range in which such alloys may be used. VT36 is among the most promising developments in the area of titanium alloys. When compared with VT18U, it is 15 percent more heat resistant at 600°C. The alloy VT8M, which is alloyed with tin and zirconium, is more crack

resistant than VT9. The alloy VT35 has an ultimate strength of 1,150 to 1,200 MPa. Another new direction is that of creating high-strength and high-temperature structural titanium alloys on the basis of a triphase structure involving α- and β-solutions and intermetallide dispersion strengthening. Titanium alloys of this type make it possible to increase their operating temperature from 300-350 to 450-500 C and ultimate strength to 1,400 MPa. A great deal of attention is being paid to developing fundamentally new alloys based on titanium aluminides (Ti_3Al and TiAl) that, at a density of 3.8 g/cm^3, make it possible to increase the working temperature to 750-800°C and elasticity modulus practically to the level of steel (170 GPa). Research is also under way to use the method of granular metallurgy to produce a new class of steel-steel composites that, by the year 2005, should boast an ultimate strength of 2,500 MPa and a five- to tenfold increase in fracture toughness. The general trend in modern aviation instrument making has demanded the development of increasingly miniaturized permanent magnets with complex configuration, and materials based on intermetallic compounds of rare earth elements and transition metals have been developed for such purposes. High-temperature nickel alloys appear to be the most promising material for turbine disks and the final stages of gas turbine engine compressors in the next decade. Principles of producing a controlled microstructure in stampings of disks providing the required set of service properties for new materials have been developed and implemented. A new class of disk materials based on nickel intermetallides is being developed that should become the primary material for gas turbine engine disks in the 21st century and that can be used at temperatures up to 950°C. The single-crystal alloys ZhS32, ZhS36, and ZhS40 are also promising. Another important problem of aviation engineering is that of protecting the surface of turbine blades from high-temperature oxidation. New high-temperature multicomponent protective coatings have been developed that have proved effective in solving the problem. New combined condensation-diffusion plasma-ion coatings have been developed that are characterized by good protective properties at temperatures of 1,100-1,200° and that result in a turbine blade life of more than 1,000 hours. In the area of ceramic coatings, new coatings with a low heat conduction, high temperature coefficient of linear expansion, and heat resistance higher than that of familiar metallic coatings of the system Ni-Cr-Al-Y have been developed and are considered promising for use in the turbines of high-temperature gas turbine engines. Work to create metal-matrix composites is proceeding in the directions of improving their service characteristics and maximum realization of the starting components' properties. A boral composite material has been created that has an optimum combination of tensile strength (1,400 MPa), shear strength (an elasticity modulus of 230 GPa), fatigue resistance, and fracture toughness. The method of vacuum-compression impregnation has been used to develop promising fiber-reinforced composites. Another promising direction in aviation materials science is that of layered metal-polymer composites. The new layered composite alor (aluminum and acrylic plastic) is 10-15 percent less dense than aluminum sheets and more resistant to the development of fatigue cracks and has better static strength and damping properties. Bionics is another fundamentally new direction in creating aviation materials. Figures 3, tables 6.

Spectral Profile of Wave Numbers of Longitudinal Vortices and Features of the Flow in a Supersonic Stream

947F0093A Moscow PRIKLADNAYA MEKHANIKA I TEKHNICHESKAYA FIZIKA in Russian
Vol. 34 No. 5 (201), Sep-Oct 93 (manuscript received 13 Nov 92) pp 41-47

[Article by V.I. Zapryagayev, S.G. Mironov, and A.V. Solotchin, Novosibirsk; UDC 533.6.011]

[Abstract] Studies of supersonic streams flowing from an axisymmetric nozzle in a nondesign mode have revealed unexplained azimuthal inhomogeneities in the distribution of their gas-dynamic parameters. One possible reason for such azimuthal inhomogeneity may be coherent vortex formations of the Taylor-Goertler vortex type. Longitudinal vortex structures have also been observed in the zone of interaction of a supersonic stream and liquid. Several publications have presented analytical descriptions of Taylor-Goertler instability in supersonic streams. The study reported herein is an expanded experimental investigation of the said phenomenon that includes sound measurements of variations in total pressure, data about the spectral profile of the wave numbers of three-dimensional inhomogeneities, and laser visualization of the stream's cross section. The experiments were conducted in a stream unit using equipment described elsewhere. The main difference between the present and previously reported experiments is that the experiments reported herein involved the use of a rotating nozzle, which made it possible to obtain data regarding the nature of the azimuthal inhomogeneities in the flow field of the entire stream (the range of variation of the azimuthal angle equaled 360° versus 57° in the previous experiments). The azimuthal inhomogeneities were studied in a supersonic underexpanded air stream flowing from an axisymmetric conical nozzle with a 0.02-m-diameter outlet into a submerged space. The stream had a Mach number of 1.5 at the outlet and, the ratio of the pressure at the nozzle section to the external pressure equaled 4.15. The Reynolds number, calculated on the basis of the characteristic stream velocity at the nozzle section, the dynamic viscosity in the submerged space, and the length of the first cell of the underexpanded stream, equaled 3.6×10^6. Because a comparison of the results obtained at nozzles with different degrees of inner-surface roughness demonstrated a link between the condition of the nozzle's inner surface and azimuthal inhomogeneity in the stream, the nozzles selected for use in the experiment had a surface rough spot height not exceeding 2.5 μm. The intensity of the inhomogeneities observed differed for different azimuthal angles. The experiments confirmed that a significant inhomogeneity in the distribution of gas-dynamic parameters in the azimuthal direction is present in the outer part of the compressed layer of a supersonic underexpanded stream and that ignoring this fact may result in a systematic error in determining gas-dynamic parameters of as high as 40 percent. The spectral measurements of the wave numbers of three-dimensional inhomogeneities indicated a complex heteroscale set of

interacting disturbances. A consolidation of the structures downward along the flow that was most likely caused by their interaction with one another and with the flow was observed. It was concluded that the observed quasi-periodic inhomogeneity of the distribution of gas-dynamic parameters along the azimuthal of the peripheral region of the stream is a result of disturbances that in all likelihood are disturbances of the Taylor-Goertler vortex type. Figures 6; references 18: 6 Russian, 12 Western.

Numerical Calculation of the Three-Dimensional Laminar Compressible Boundary Layer on Contoured Delta Wings With Supersonic Leading Edges

947F0093B Moscow PRIKLADNAYA MEKHANIKA I TEKHNICHESKAYA FIZIKA in Russian Vol. 34 No. 5 (201), Sep-Oct 93 (manuscript received 3 Nov 92; after revision 1 Oct 92) pp 88-94

[Article by V.N. Vetlutskiy and T.V. Poplavskaya, Novosibirsk; UDC 532.526]

[Abstract] The problem of calculating a three-dimensional compressible laminar boundary layer on a contoured delta wing with supersonic leading edges has been formulated and presented along with an algorithm for solving it. The algorithm has been used to perform calculations for the windward and leeward sides of a wing with a sweep angle (χ) of 45° given a Mach number (M_∞) of 3 and for the windward side of a wing with the same sweep angle and Mach numbers of 3 and 6 for any number of angles of attack (α). The effect of Mach number, angle of attack, and relative profile thickness on friction coefficient and its contribution to the wing's total drag have been investigated. Selected results of the calculations are as follows. The adjusted values found for a contoured wing exceed their values for a plane wafer by 30 percent. The difference between the values found for the friction coefficient on the nose and those on a plane wafer is much greater when $M_\infty = 6$ than when $M_\infty = 3$. Calculations of the effect of the angle of attack on the distribution of the friction coefficient on the leeward side of a contoured wing indicate that the friction coefficient decreases by about 15 percent when α is increased by 5° and that, given identical profile thicknesses and Mach numbers, the curves plotted for the friction coefficient (and also for the Stanton number) for different angles of attack are qualitatively similar to one another. A calculation of the contribution of the total intensity of friction (CF_α) to the total drag (CX_0) for each wing surface given $Re_1 = 10^5$ indicates that as M_∞ [illegible] ne value of CF_α decreases somewhat when $\alpha = 0$ a[illegible]ases when $\alpha = 5°$, however, wave drag decreases sig[illegible]cantly, which results in an increase in the contribution of friction forces from 67 to 79 percent when $\alpha = 0$ and from 21.5 to 43 percent when $\alpha = 5°$. The value of CF_α is on average 15 percent greater for a contoured wing than for a delta wafer; however, wave drag is significantly greater in the case of a contoured wing, which reduces the contribution of friction forces to total drag when compared with that in the case of a plane delta wafer. An analogous phenomenon is observed when the angle of attack is increased. Although the value of CF_α increases when α is increased from 0 to 5°, wave drag increases more, and as a result, the contribution of friction forces decreases from 67 to 21.5 percent when $M_\infty = 3$ and from 79 to 43 percent when M_∞. Figures 6, tables 2; references 12 (Russian).

Electro-erosion Machining in Aviation Engine Construction

947F0085 Kishinev ELEKTRONNAYA OBRABOTKA MATERIALOV in Russian No. 6, 1993 (manuscript received 17 May 93) pp 18-21

[Article by V. I. Polyanin, A. K. Altynbayev, B. Ye. Karasev, Scientific Research Institute of Engines]

[Abstract] This paper examines the use of electroerosion machining (electic discharge machining, EDM) on current-carrying materials (copying and piercing operations). Conclusions reached from experience using EDM are expressed. Methods of improving EDM equipment are outlined, and include: increasing the range of pulse characteistics, better monitoring of the machining process, more flexible control, specialized machinery, new materials, special liquids for the machining process, and expert systems to design procedures. Flexible modules for piercing operations are described in detail. Current equipment achieves an accuracy of 0.01 mm. A number of machines in the SEP series have been developed for EDM. In one pass the machines can make up to 15,000 perforations; depending on the number and diameter of the holes this can take 30-70 minutes. The SEL-1 is a specialized machine tool with a semi-automatic mode, and it is described. It has two independent heads and machines the channels between the blade of monorotors. The accuracy achieved in 0.05 mm; the roughness ratio is 2.5. References 3 (Western).

Study of the Development of Turbulence in the Region of a Break Above a Triangular Wing

947F0083 Novosibirsk SIBIRSKIY FIZIKO TEKHNICHESKIY ZHURNAL in Russian No. 6, 1993 (manuscript received 28 Jul 93) pp 22-25

[Article by S. P. Bardakhanov, A. V. Keyno, V. V. Kozlov, Institute of Theoretical and Applied Mechanics, Siberian Division, Russian Academy of Sciences, Novosibirsk; UDC 532.526]

[Abstract] This paper clarifies the picture of the flow around triangular wings with a large sweepback at large attack angles. Experiments were conducted at subsonic speeds. Artificial turbulence was induced. Secondary eddy structures were formed which are similar to Taylor eddies between coaxial rotating cylinders. These structures lead to a laminar-turbulent transition. Creation of turbulence in the eddy may occur without altering the profile of the average speed, that is, without eddy decay. Figures 3; references 6: 4 Russian, 2 Western.

OPTICS AND HIGH ENERGY TECHNOLOGY

Optical Reconstruction of Microwave Holograms

947F0088A Moscow VESTNIK BELORUSSKOGO GOSUDARSTVENNOGO UNIVERSITETA. SERIYA 1. FIZIKA, METEMATIKA, MEKHANIKA in Russian No. 3, Sep 93 (manuscript received 22 Mar 93) pp 17-21

[Article by V.I. Kondratenko, N.I. Aleshkevich, I.V. Koval, and Ye.L. Tikhova; UDC 621.373.826]

[Abstract] One of the main conclusions of published discussions of optical reconstruction of holograms is that it is impossible to achieve correspondence between the lengthwise and crosswise scales of transformation of the field. This fact is a serious obstacle in analyzing antennas' directional patterns with optical information processing equipment to reconstruct microwave holograms. The optical reconstruction of microwave holograms in the absence of constraints on coaxiality of the optical transparent and image has been considered in a mathematical analysis. The radiation spectrum has been calculated as a function of the reference wave's angle of incidence, and the possibility of undistorted modeling of the directional pattern of a microwave antenna based on its hologram in the Fresnel region zone has been indicated for the one-dimensional case. An analogous consideration of a two-dimensional hologram confirmed the violation of the equality of the scales of transformation in the plane of the image and, accordingly, in spectral frequencies. Scale correspondence may be achieved only in a single cross section of the directional pattern, which must be taken into consideration when measurements are taken. Tables 6 (Russian).

NUCLEAR AND NON-NUCLEAR ENERGY

Modeling of Radiative-Convective Heating of Cohesive Soil Granules in Low-Temperature Plasma Streams

947F0115A Novosibirsk PRIKLADNAYA MEKHANIKA I TEKHNICHESKAYA FIZIKA in Russian No. 6, Nov-Dec 1993 (manuscript received 30 Nov 92; after revision 18 Jan 93) pp 94-98

[Article by A. L. Burko, V. N. Yefimenko, Novosibirsk, Tomsk; UDC 624.131.22:533.9...15:625.7/.8]

[Abstract] One method of keeping up the pace of road construction in regions without stone deposits and with sparse transport and production facilities is the use of thermally fortified soil in the earthen road bed and top dressing. The local soil is pregranulated and dried in reactors equipped with electric arc plasmotrons. Optimal granule size must be determined, as well as the thermal processing parameters. High-temperature processing of granules in gas streams generated by electric arc plasmotrons involves complex radiative and convective heat exchange. This paper attempts to consider radiative and convective heat exchange in the heating of spherical soil particles in a stream of low-temperature plasma. The temperature distribution over the radius of the spherical particle is determined from the beginning of thermal processing. The temperature dependence of the thermal conductivity of the soil was determined experimentally in the 20-1200 C range and can be tracked for a specific initial temperature of the sphere and gas medium temperature. It was found that for a wide range of radii the movement of the thermal pulse from the surface to the center of the particles occurs at an approximately uniform speed. Radiative heat exchange plays a significant role in radiative-convective heating of the particles. Other aspects of thermal processing are examined. Further research is needed to determine optimal parameters. Figures 2; references 6: 5 Russian, 1 Western.

Model of the Dynamic Destruction of the Heat-Releasing Element of a Reactor in Uncontrolled Introduction of Positive Reactivity

947F0115B Novosibirsk PRIKLADNAYA MEKHANIKA I TEKHNICHESKAYA FIZIKA in Russian No. 6, Nov-Dec 1993 (manuscript received 16 Jun 92; after revision 23 Dec 92) pp 142-147

[Article by R. M. Aksenov, O. V. Kovalenko, V. K. Sirotkin; UDC 621.039]

[Abstract] This paper proposes a model describing the deformation and destruction of heat-releasing elements due to a pulsed energy release which arises in an uncontrolled release of positive reactivity into a reactor. The pulse is less than one second long. It is assumed that the jacket is destroyed by high-speed deformation due to internal pressure. In addition to pressure due to heating and evaporation of water, this paper also considers thermal expansion, fusion of fuel, and the presence of gas in the gap and within the fuel. A single approach is used to describe the dynamics of heat-releasing element behavior (in particular, the increase in internal pressure) and the threshold value of destruction in relation to energy release pulse parameters and the initial state of the heat-releasing element. Model figures agree with theoretical values for pressure amplitude and the onset of heat-releasing element destruction. As the proportion of gas increases, the threshold of destruction increases. The threshold power of the burst decreases as pulse length increases. Figures 4; table 1; references 9: 3 Russian, 6 Western.

Concept of Safe Shell Type Water Cooled Reactor With HTGR Fuel Microelement Based Fuel Modules

947F0074A Moscow ATOMNAYA ENERGIYA in Russian Vol. 75, No. 6, 1993 pp 417-423

[Article by A.O. Goltsev, N.Ye. Kukharkin, I.S. Mosevitskiy, N.N. Ponomarev-Stepnoy, S.V. Popov, Yu.N. Udyanskiy and V.F. Tsibulskiy (Nuclear Reactors Institute), RNTs [Republican Science Center] "Kurchatovskiy Institut"; received July 9,1993; UDC 621.039.58]

[Abstract] The problem of assessing the safety of AESs during severe accidents determines to a large degree future development of nuclear power industry. The most severe AES accidents that can lead to extensive radioactive contamination of the environment are the so called heat removal and reactivity type accidents. Currently there are two prevailing trends in solving the safety problem development of more reliable systems with multiple redundancy and additional safety barriers to propagation of fission products, or development of new in principle reactors wherein the possibility of accident creating processes is eliminated. The best way is an optimum combination of the two directions. With this in mind the authors discuss the possibility of using in water-cooled reactors fuel compositions based on fuel microelements used in high-temperature gas-cooled reactors (HTGR). The article

examines an arrangement that gives a reactor unit a conceptually new quality. Preliminary analysis demonstrated that the proposed concept makes it possible to solve the AES radiation safety problem during an accident accompanied by complete loss of the heat-transfer medium and thus come substantially closer to solving the problem of reactivity accidents. The article describes a fuel module with fuel microelements, the reactor, neutron-physical and thermal physical features of the reactor core, and reactor behavior during a severe accident accompanied by complete loss of the heat-transfer medium. The use of such reactors will increase the cost of electrical power by 10-15%. Figures 5

Classification of AES Operator Support Systems

947F0074B Moscow ATOMNAYA ENERGIYA in Russian Vol. 75, No. 6, 1993 pp 423-426

[Article by A.S. Alpeyev, NTTs S&T Center YaRB [expansion not given] RF [Russian Federation]); received Oct.25,1993; UDC 621.039.50+621.3.015]

[Abstract] The author proposes a new classification of subsystems of a system for automated control of technological processes in an AES power unit. The classification singles out the human operator as the main component that coordinates local goals control of power unit equipment, participates in control implementation and is responsible for safe operation of the AES. It is well known that the structure of any automatic control function consists of four components:information, situation identification, control decision making and implementation of the control decision. The classification for an operator support system will include four classes of systems: information support, situation assessment support, control decision making support and support of control decision implementation. The goals of each of the above classes of an operator support system are listed and explained. There are several serious problems with practical implementation of these goals by operator support systems. The most important problem is software certification. Among other problems are the impossibility in principle to simulate all failures of automation devices and a legal problem the responsibility for recommendations of the operator support system. A less serious problem is organization of personnel training interactively with support systems.

Statistical Characteristics of Space Distribution of Radio Nuclide Contamination of Territories Caused by Chernobyl AES Accident

947F0074C Moscow ATOMNAYA ENERGIYA in Russian Vol. 75, No. 6, 1993 pp 448-453

[Article by R.V. Arutyunyan, L.A. Bolshov IBRAE [expansion not given], Russian Academy of Sciences, S.K. Vasilyev, I.V. Yevdokimov, B.F. Petrov and L.A. Pleskachevskiy (NPO [scientific product association] "Radiyevyy institut imeni V.G. Khlopin"); received May 28,1993; UDC 621.039.58]

[Abstract] Random (statistical) processes have played an important role in forming space distribution of radioactive contamination caused by the Chernobyl AES accident. There are fluctuations caused by nonuniform precipitation due to medium)scale (several hundred meters) atmospheric turbulence. Thereafter such statistical phenomena are called intermediate statistics. Local fluctuations of contamination density due to heterogeneous migration of radio nuclides (caused first of all by microrelief of the terrain) when the size of the studied territory is under 10 m are called local statistics. The objective of the work was to determine the character of statistical distributions caused by local and intermediate statistics, the number of soil samples necessary for determining the surface density of radioactive contamination with required accuracy, and parameters and structures of statistical regularities of the entire set of available data on soil pollution in Bryansk oblast settlements (selected because the largest volume of information is available for the oblast). At the local statistics level the distribution of radioactivity of soil samples is lognormal. At the intermediate statistics level the distribution is also lognormal, but with a larger standard deviation. Figures 8, references 3: 2 Russian, 1 Western.

Space Regularities of Distribution of Radioactive Contamination Caused by Chernobyl AES Accident

947F0074D Moscow ATOMNAYA ENERGIYA in Russian Vol. 75, No. 6, 1993 pp 453-457

[Article by R.V. Arutyunyan, L.A. Bolshov IBRAE [expansion not given], Russian Academy of Sciences, S.K. Vasilyev, A.D. Gedeonov, I.V. Yevdokimov, B.F. Petrov and L.A. Pleskachevskiy (NPO [scientific production association] "Radiyevyy institut imeni V.G. Khlopin"); received May 25,1993; UDC 621.039.58]

[Abstract] Because of difficulties in performing direct radiochemical analysis of microscopic amounts of ^{90}Sr and $^{239+240}$Pu and the ambiguity of derived results it is necessary to find ways for indirect estimates of concentrations of these radio nuclides in environmental samples based on the content of gamma radiators. ^{144}Ce content and concentration and isotope content of plutonium in soil samples were determined. The objective of the work was to develop a model that would make it possible to assess contamination of territories with ^{90}Sr and plutonium based on data of contamination of the territories with gamma-radiating radio nuclides. The first stage of the work consisted of experimental measurements that provided gamma-spectrometry and radiochemical analysis of soil samples taken at settlements with various levels of contamination located at various distances from the Chernobyl AES. During the second stage correlation analysis of Goskomgidromet [USSR State Committee for Hydrometeorology] data and experimental measurements conducted by the authors was performed. A linear model satisfactorily describes the relationship between ^{90}Sr and ^{137}Cs in the remote zone (Bryansk oblast) soils and makes it possible to estimate territory contamination with ^{90}Sr based on data of ^{137}Cs contamination. Figures 4, references 10: 7 Russian, 3 Western.

Reconstruction of Dose of Transuranium Radio Nuclide Irradiation of Population of Regions Remote from Chernobyl AES Accident Site

947F0074E Moscow ATOMNAYA ENERGIYA in Russian Vol. 75, No. 6, 1993 pp 457-465

[Article by K.P. Makhonko (Experimental Meteorology Institute, NPO [scientific production association] "Tayfun"); received June 9,1993; UDC 614.876:551.510.72]

[Abstract] The article presents results of calculation of the dose load of plutonium isotopes and ^{242}Cm measured at the town of Baryshevka (145 km southeast of the Chernobyl AES and 45 km east of Kiev), Obninsk (107 km southwest of Moscow) and the central part of Moscow. Data for Kiev were not used because observations there only began on May 9. The highest concentration of radioactive products was observed in April and early May 1986. In Baryshevka the radiation dose has shaped by May 1, but in Obninsk and Moscow it kept rising in May and by June 1 it had doubled in Obninsk and tripled in Moscow. The main radiation dose is received by bone surfaces it is approximately four times higher than the dose received via lungs and liver and ten times higher than the dose received by bone marrow. Based on the obtained data the number of people that will develop cancer and the probability of cancer risk in Baryshevka, Obninsk and Moscow were calculated. Also calculated was the effective equivalent radiation dose due to inhalation of the sum of plutonium isotopes and ^{242}Cm for various population groups in Baryshevka. The calculated doses are approximate estimates from above, i.e. actual effective equivalent doses shall not exceed the calculated values. Figures 2, tables 3, references 6: 5 Russian, 1 Western.

Tritium in Ignalina AES Environment

947F0074F Moscow ATOMNAYA ENERGIYA in Russian Vol. 75, No. 6, 1993 pp 471-477

[Article by I. Mazheyka, R. Pyatroshyus (Geology Institute, Lithuanian Republic), R. Yasyulyonis and P. Shirvaytis (Physics Institute, Lithuanian Republic); received Nov. 4.1992; UDC 621.039.8:504(474)]

[Abstract] Recently AESs have become an important source of tritium in the environment. Its content in AES regions in Russia and Ukraine has been increasing. Studies of tritium in the Ignalina AES region have been conducted since 1983. Concentration of tritium was measured in atmospheric moisture and precipitation and in surface, ground and artesian water. Emission of tritium in 1985-1992 as a result of Ignalina AES activity was calculated. Complex variances of distribution of tritium in the water objects in the Ignalina AES region demonstrate its important ecological role. Accumulation of tritium in vegetation can be up to 200 times higher than background amount. These effects can occur in the AES region, and they can affect dose loads. Figures 5, tables 3, references 10: 8 Russian, 2 Western.

Creation of an Atomic Power Plant Safety System Based on Passive Operating Principles

947F0078A Minsk VESTSI AKADEMII NAVUK BELARUSI. SERIYA: FIZIKA-TEKHNICHNYKH NAVUK in Russian No. 3, 1993 (manuscript received 1 Feb 93) pp 92-99

[Article by L. I. Kolykhan, Institute of Energy Problems, Academy of Sciences of Belarus; UDC 621.311.25: 621.039.5]

[Abstract] The VVER-92 power plant design, like the APWR, Konvoi-95, MARS, ABWR, BWR-90, and Candu-3 designs, implements passive and active safety systems which prevent rupture of the core and protective hull, prevent leakage of radiation into the environment, and shut down the supply of energy and maintain control in emergency situations. These systems reduce the probability of a serious accident by an order of magnitude while reducing capital investment and cost price to 15-20%. The AR-600, SIR, SBWR, and V-600 designs make greater use of passive systems, which simplifies the design and reduces the number of components in the first circuit by a factor of 2-6. Construction based on these designs may begin in 1995-2005. The efforts of leading machine building and construction firms in the field of energy are focused on the development of new generation of plants using light-water reactors (up to 1300 MW). These plants should be built in the next 10-30 years and meet current requirements for safety and competitiveness. The VVER-92 design has an accident probability of about $2.5X10^{-7}$ reactor-years. Predominantly passive systems are used in this design. The design conserves materials while providing a double hull for protection. Figures 3; references 31: 12 Russian, 19 Western.

Device To Scrub Outgoing Gases

947F0078B Minsk VESTSI AKADEMII NAVUK BELARUSI. SERIYA: FIZIKA-TEKHNICHNYKH NAVUK in Russian No. 3, 1993 (manuscript received) pp 109-111

[Article by T. N. Dovloysheva, V. V. Demyanchuk, G. I. Novikov, O. P. Gorbonos, Kirov Belarusan Technical Institute; UDC 621.039.76:504.055]

[Abstract] Hot flue gases are filtered by a stainless steel grid with a wire diameter of 0.003-0.004 mm. The housing of the unit contains multiple units consisting of several stages each. The height of the housing and the number of units are determined by the type of fuel and the rate of gas flow. Each unit contains a latticed disk attached to the face of the first stage. The diameter of each stage is determined by the diameter of the previous one. The effectiveness was tested. The number of solid particles is determined, as is the dependence of the degree of scrubbing on the number of filters for a particle size of 1.0 μm. Scrubbing decreased with the number of filters. By regulating the number of filters one can obtain the optimal ratio of the gas dynamic resistance of the scrubber and the degree of scrubbing. The device is most effective on particles 1.0 μm in size and greater. A 70% rate of scrubbing can be obtained. The device can be removed and cleaned for repeated use. Figure 1; table 1; references 4: 3 Russian, 1 Western.

Locations of Secondary Accumulation of Technogenic Radionuclides in River Valleys

947F0078C Minsk VESTSI AKADEMII NAVUK BELARUSI. SERIYA: FIZIKA-TEKHNICHNYKH NAVUK in Russian No. 3, 1993 (manuscript received 16 Sep 92) pp 111-114

[Article by V. A. Kuznetsov, V. A. Generalova, V. P. Kolenenkov; UDC 550.4:546.7:796(476)]

[Abstract] While areas of primary introduction of radioactive materials have been studied, secondary regions (where radioactive material has been introduced by geological and

geochemical processes) have not. Studies of the rivers of southeast Belarus revealed the collection of radioactive material in sedimentation of terrigenic material, from organic and clay formations, and in soils in the humus, ortstein, and illuvial layers, as well as in various alluvial facies. Channel central, and terrace flood plains were studied, as well as terraces above the flood plain. A table lists the location (geological formation), facies conditions, precipitation, the isotope and concentration, and examples of specific locations in Belarus. The ratio of present radioactivity to the 1986 and 1989 background is 2-5, and more rarely, 10. However, higher levels may be found along shorelines. Wind and water drive dust particles and aerosols to shorelines where they accumulate. It is recommended that radiometric surveying be done every 5-7 years. Table 1; references 12: 11 Russian, 1 Western.

Flowchart for Designing Radiation Safety in Ukraine

947F0079A Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No. 1, Jan-Feb 94 (manuscript received)

[Article by V.N. Matichuk, engineer, and B.V. Solukha, doctor of biological sciences, Power Generation Equipment Design Institute (Energoproyekt) and VNIITAG (expansion not given); UDC 621.039+502.7]

[Abstract] A flowchart outlining a plan for ensuring Ukraine's radiation safety has been presented. The proposed plan calls for developing a monitoring system that is based on an automated system of current information and that includes five main components as follows:

- ecological monitoring;
- nuclear power plant monitoring;
- an emergency control point;
- a crisis center;
- an automated radiation situation monitoring system.

The ecological monitoring component calls for developing an automated system of up-to-date information on Ukraine's environment and forecasts of any changes therein. The nuclear power plant monitoring will, through an automated system, provide current information regarding the condition of the environment of rayons with nuclear power plants and will also forecast changes likely to occur therein. These forecasts will be based on numerous data sources, including meteorological, geophysical, hydrological, geochemical, hydrogeological, aerologic, actinometric, radiometric, biological, and special medical observations. These forecasts will be used to plan environmental protection measures and measures to recover materials released from nuclear power plants. The emergency control point will serve as the site where recommendations are formulated regarding emergency measures to be taken at nuclear power plants and from which technical and organizational assistance can be provided to individuals managing emergency, rescue, and restoration operations during the clearing of accidents, catastrophes, natural disasters, or damage inflicted on nuclear power plants as a result of sabotage or military actions. The control center will also maintain communications with government and social organizations. The automated radiation situation monitoring system will monitoring and forecast radiation situations at nuclear power plants, in exclusion zones, and in observation zones during normal plant operations and in the event of an accident. The routing of information from source to user will vary depending on the type of monitoring being conducted (i.e., regular, operational, special). The exact interaction between the various monitoring system elements is still being worked out. Figure 1.

Automatic Liquid Medium Viscosity Monitoring in Closed-Cycle Devices

947F0090A Moscow ZAVODSKAYA LABORATORIYA in Russian Vol. 60 No. 1, Jan 94 pp 23-25

[Article by M.M. Mordasov, Tambov Chemical Engineering Institute; UDC 532.137:53.082.32]

[Abstract] The urgency of pneumatic monitoring of the physical and chemical properties of liquid media in production systems, e.g., by using a rigid-wall chamber-type transducer (KPP), prompted the development of an immersible capillary automatic viscosimeter which realizes the pneumatic method of measuring the liquid outflow through the capillary. The design and operating principle of the new instrument are described in detail, and a schematic diagram is cited. A system of differential equations which describes the processes in the automatic viscosity-to-pneumatic signal transducer is derived, and the equation's coefficients are summarized in a table. The device has a measurement range of $(0.5\text{-}2.5)\ 10^{-3}\ m^2s^{-1}$ at a temperature of 20°C, a response of $87\ 10^{-3}\ s/m^2s^{-1}$, and a basic adjusted error of 3.5%. The pneumatic rectangular output signal has a duration equal to the monitored liquid outflow doze duration; the primary signal is converted by a secondary transducer into viscosity readings in a digital form. The automatic capillary viscosimeter's operations can be analyzed theoretically. Figures 1; tables 2; references 6.

Methods of Assessing Performance Reliability of Glued Joints of High-Strength Film-Forming Glues

947F0092A Moscow ZAVODSKAYA LABORATORIYA in Russian Vol. 60 No. 1, Jan 94 pp 40-43

[Article by G.N. Finogenov, N.S. Rogov, All-Russian Institute of Aviation Materials, Kiev; UDC 620.192.46:668.31]

[Abstract] The utility of long-term crack resistance measurements during stress-induced aging, usually accompanied by the development and realization of several combinations of adhesive and cohesive glued joint failures as a result of cracking, and the relative ease and accessibility of the wedge method for crack resistance testing in an aging-inducing environment, e.g., for glued rectangular slabs, prompted the selection of the crack propagation work in the glued joint per unit of linear measure or the energy release rate at separation as the crack resistance criteria. The energy release as measured by the wedge method rate is calculated and a formula is derived whereby the crack resistance criterion is expressed as a function of the wedge

and slab thickness, crack length, and the slab metal modulus of elasticity. The proposed criterion and testing method make it possible to analyze the crack resistance of virtually any structural adhesive and determine its compliance with the safety requirements which ensure the operational reliability of the glued structure. It is noted that in mechanical engineering, the energy release rate in machines at which the crack virtually does not grow is used as the long-term crack resistance criterion. Figures 5; tables 2; references 8: 6 Russian, 2 Western.

Intense Energy Conservation: Preconditions, Methods, Consequences

947F0071A Moscow TEPLOENERGETIKA in Russian No. 1, 1994 pp 12-16

[Article by A. D. Klyuchnikov, Moscow Energy Institute; UDC 658.511.2.004.18]

[Abstract] In all stages of production and conversioN of primary sources of energy, transport, and final use of the energy potential of primary energy sources there are considerable energy losses. It is crucial to determine the actual losses and quality of use of primary fuels. This paper presents an estimate of energy loss in the complete cycle of using the energy potential of primary fuel in material production. Examples of the quality of use of fuel-energy resources in various thermal technological systems in energy-intensive areas of industry are examined. A particular example presented is cast metallurgy. Schematics are presented to organize the consideration of energy conservation measures so that no options are overlooked. The principal possibilities for large-scale reduction of fuel-energy use are established based on intensive energy conservation measures. Figures 7.

Improving Basic Operational, Technical, and Economic Indicators of Steam Turbines

947F0071B Moscow TEPLOENERGETIKA in Russian No. 1, 1994 pp 16-22

[Article by A. D. Trukhniy, A. G. Kostyuk, B. M. Troyanovskiy, Moscow Energy Institute; UDC 621.165]

[Abstract] This paper summarizes ongoing work and plans to increase the effectiveness and reliability of steam turbines. The turbines were studied at the department of steam and gas turbines at the Moscow Energy Institute. A set of programs has been developed to determine the stress on turbine elements, in particular, shaft line vibration. The programs also formulate recommendations for design modification to increase vibration resistance. Examples are presented. The recommendations have eliminated the problem of self-exciting vibrations (at low frequencies) and in some cases have made the turbines more economical. The lifetime of turbines can be determined. Fatigue and corrosive fracturing can be evaluated. Figures 9.

Development of Monitoring Systems for the Water-Chemical Mode of Thermal and Atomic Energy Plants

947F0071C Moscow TEPLOENERGETIKA in Russian No. 1, 1994 pp 46-50

[Article by V. N. Voronov, P. N. Nazarenko, I. S. Nikitina, A. P. Titarenko, A. G. Shmelev, Moscow Energy Institute; UDC 621.311.22.621.182.12]

[Abstract] This paper presents a general approach to the creation of a water-chemical model monitoring system for thermal and atomic energy plants. Specifications and features of existing systems of automatic chemical monitoring systems are examined. Key problems to be resolved in the design of such systems are minimization and optimization of the area occupied by instruments and software development. A table presents specifications of automatic chemical monitoring devices produced in Russia. Sample handling techniques and possible resultant errors are described. A schematic of a chemical-technological monitoring system is presented. Operations carried out by the system are listed. The prospects for the use of ion chromatography are outlined. Figures 2; tables 2; references 5 (Russian).

Using Thermochemical Natural Gas Processing To Modernize Steam-Turbine Units

947F0080A Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No. 1, Jan-Feb 94 (manuscript received 7 Jul 93) pp 9-14

[Article by L.L. Danilov and A.A. Krivokon, candidates of technical sciences, V.G. Nosach, doctor of technical sciences, and S.V. Yatskevich, engineer, Engineering Thermophysics Institute, Ukraine Ministry of Power and Electrification; UDC 621.311.22]

[Abstract] In 1992, Ukraine's Ministry of Power and Electrification began financing work to create a new process for fuel utilization at thermal electric power plants. In the new process, natural gas is subjected to thermochemical processing before being burned. As part of research in this direction, a thermodynamic analysis was performed to compare a natural gas conversion method with endothermal effects to one with exothermal effects. The analysis established that endothermal conversion in steam-gas units would provide the biggest efficiency gains but would also necessitate the redesign of equipment currently in place at the republic's thermal electric power plants. Thermodynamic analysis of the binary unit in which natural gas is subjected to exothermal conversion before being burned demonstrated that choosing a thermal layout with a thermochemical gas-turbine superstructure would result in improved efficiency thanks to a reduction in unrecoverable losses in the heat production process. As a result, it would be possible to modernize existing thermal electric power plants in such a way that the efficiency of transforming heat to work could remain unchanged. R&D performed jointly with the Power Generation Equipment Design Institute [Energoproyekt] confirmed the possibility of boosting the efficiency of natural gas utilization without altering existing thermal power generation equipment. Many of the currently used methods of reducing NO_x emissions call for altering the gas-burning process by reducing the maximum jet temperature and creating enriched conditions by varying the intensity of mixing fuel and oxidizing agent. Two-stage combustion is one of the most radical methods of suppressing NO_x. A system for burning natural gas after preliminary exothermal conversion is essentially no different from conventional two-stage burning systems. Consequently, modernizing thermal electric power plants by installing a gas turbine superstructure

with thermochemical natural gas processing not only boosts plant efficiency but also significantly reduces NO_x emissions. Calculations of key operating indicators before and after the proposed modernization were performed for scenarios assuming steam-turbine unit efficiencies of 39% and 41%. Figures 3, table 1; references 3 (Russian).

Creating Fuel and Energy Complexes Based on New Ukrainian Coal Deposits

947F0080a Kiev ENERGETIKA I ELEKTRIFIKATSIYA in Russian No. 1, Jan-Feb 94 (manuscript received 13 Jul 93) pp 19-21

[Article by A.N. Golyba and V.K. Zaruba, candidates of technical sciences, and T.A. Oks, engineer, Power Generation Equipment Design Institute (Energoproyekt), Kharkov; UDC 662.66]

[Abstract] Now that Ukraine has gained independence, it must find ways of meeting its energy needs through its own energy resources. At present, Ukraine's own energy resources are providing no more than 30 percent of the power needed by the country. Because Ukraine virtually lacks reserves of gas-and-oil reserves, it should concentrate on developing its solid fuel reserves and using them to meet its energy needs. To make fuel supply as reliable as possible, Ukraine should locate its thermal electric power plants [TES] and fuel bases as close to one another as possible so as to create "coal deposit-TES" complexes. On the basis of R&D conducted at the Ukraine Coal, Ore, and Gas Industry Scientific Research and Design Institute [UkrNIIproyekt] and State Mine and Ore Enrichment Plant Design Institute [Yuzhgiproshakht] developments, researchers from the institute Energoproyekt in Kharkov are working to develop "coal deposit-TES" complexes near the Barvenkovskoye and Bogdanovskoye deposits. The 12-km^2 Barvenkovskoye deposit, which is located in the south of the Kharkov Oblast, contains lignite and is suitable for open-pit mining. The Barvenkovskoye coal is of medium quality and has been characterized as follows: calorific value, 2,000 kcal/kg; moisture content, 45 percent; ash content, 13.7 percent; sulfur content, 1.5 percent; and yield of volatiles, 60 percent. The mine is suitable for stripping at a rate of 8 million tonnes of coal yearly, and that amount may expanded to 12 million tonnes in the future. Barvenkovskoye coal may be burned in boilers at electric power plants and is also suitable for briquetting and for coal-chemical processing. Its quality is similar to that of the lignites of the Ural and Aleksandriyskoye deposits, the Kansk-Achinsk Basin, and the Yugoslavian and German lignites that are widely used in power generation. The Bogdanovskoye deposit measures 24 by 20.5 km and is located in the new Northern Donbass Coal Region in the north of the Lugansk Oblast and is estimated to contain total reserves of 1,068 million tonnes and commercial-quality reserves of 860 million tonnes. Coal from the Bogdanovskoye deposit is characterized as follows: average calorific value, 4,362 kcal/kg; ash content, 24.8 percent; moisture content, 17.2 percent; sulfur content, 1.6 percent; yield of volatiles, 45.9 percent; ash melting point, 1,110°C; and level of easily sublimed Na_2O in coals supplied to GRES, 1.2 percent. Preliminary estimates have indicated that the Barvenkovskoye deposit may be used as a basis for constructing a 1,600- to 1,800-MW state regional electric power plant [GRES] and that the Bogdanovskoye deposit is sufficient as the basis for a "coal deposit-TES" complex that includes a 2,700-MW GRES. In view of the great inertia of Ukraine's fuel-and-energy complex, technical and economic reports regarding the creation of "coal deposit-TES" complexes for the Barvenkovskoye and Bogdanovskoye deposits need to be completed in 1993-1994. Table 1.

New Oil and Gas Sources in Ukraine

947F0084A Kiev VISNYK AKADEMIYI NAUK UKRAYINY in Ukrainian No. 10, 1993 pp 32-39

[Article by Geotectonics Department Head, Geological Sciences Institute, AN [Academy of Sciences] of Ukraine, Academician Ivan Illich Chebanenko, Head, Geology and genesis of Oil and Gas Deposits Department, Geological Sciences Institute, AN of Ukraine, Doctor of Geological Mineralogical Sciences Vladilen Oleksiyovych Krayushkin and Head, Laboratory of Fracture Tectonics and Oil and Gas Capacity of Pre-Cambrian Geological Structures, Geological Sciences Institute, AN of Ukraine, Viktor Petrovych Klochko]

[Abstract] Ukraine's demand for oil and natural gas is substantially higher than oil and gas production in the Dnieper-Donets, sub-Carpathian and Crimea sub-Black Sea regions. The situation can hardly change to the better if geological surveying keeps concentrating along usual directions. The most promising way is the use of nontraditional natural sources of oil, gas and condensate first of all in deep Earth's crust zones and zones of gas hydrate formation (GHF) under the Black Sea. In the authors' opinion Ukraine has no other geological opportunities. In 1985-1987 12 commercial oil and gas deposits had been discovered on the northern board of the Dnieper-Donets Depression (DDD). The authors assessed the size of oil and gas reserves in those deposits using two different methods. Also oil and gas were discovered on the DDD southern board. There are also prospects for finding oil and gas deposits in Western Ukraine. Another nontraditional and promising direction is oil and gas prospecting in the astrobleme zone. There are six known astrobleme zones in Ukraine. The third direction is prospecting for and commercial use of subhydrate hydrocarbon gas and hydrocarbon gas hydrates in the Black Sea. The three proposed approaches should be viewed as additional to currently used traditional geological prospecting methods. Tables 1, references 9: 7 Russian, 2 Western.

New Gas and Oil Deposits Detected in Ukraine

00000000 NAFTOVA I GAZOVA PROMYSLOVIST in ???????? Jul-Sep 93, etc.

[Editorial report] New oil and gas fields with potential for industrial exploitation have been discovered in Ukraine thanks to novel exploration methods (Kiev NAFTOVA I GAZOVA PROMYSLOVIST [OIL & GAS INDUSTRY] No. 3 Jul-Sep 1993). Two gas deposits and 10 fields containing both oil and gas were detected at the northern edge of the Dniepr-Donets Depression, the main oil and gas producing region of Ukraine. The newly discovered

fields are believed to contain over 250 million tons of hydrocarbons, and the stratigraphic range of the commercially exploitable oil and gas deposits is over 1000 meters. This is the first time that industrial quantities of hydrocarbons have been found in Ukraine in crystalline basement rock, which was previously considered to be unpromising for exploration. The deposits' relative proximity to the surface means that they can be exploited with existing equipment, material and technology, and without foreign investors. These circumstances heighten the significance of the discovery for Ukraine, which lacks the materials and equipment required to explore its main hydrocarbon reserves, located at depths of 5,000 to 10,000 meters (Moscow IZVESTIYA 12 Sep 92). The deposits have the added advantage of being located near large industrial users in Kharkhov, Okhtyrka and Sumy.

The new exploration techniques consist of a set of highly accurate and efficient nonstandard geophysical surveys developed for detecting oil and gas in sedimentary mantle and crystalline basement rock. One innovation, conducting zonal seismic surveys longitudinally along discordant faults, made it possible to detect fairly long lines of folds rapidly and prepare them for exploratory drilling. Seismostratigraphic analysis was used to detect untraditional forms, such as horst, paleovalleys and wide fractured zones, which characterize structure in sedimentary mantle. The authors of the NAFTOVA I GAZOVA PROMYSLOVIST article proved experimentally that low-value anomalies in pseudoacoustic and pseudointerval rates associated with fractured rock zones are caused by high porosity and, for the most part, with gas saturation. These survey methods were developed under a state program drafted by the authors and can be used in other territories of Ukraine.

Ukraine has been seeking to reduce its 80 percent dependence on gas imports from Russia and Turkmenistan by boosting domestic production, now at one-third its 1990 level. A comprehensive national program "Ukrainian Gas and Oil to 2010" is addressing problems in oil and gas exploration, production, and processing (Kiev DEMOKRATYCHNA UKRAYINA 3 Jul 93).

Russian Oil Refining Industry—Today and Tomorrow

947I0077A Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No. 9, Sep 93 pp 4-6

[Article by E.F. Kaminskiy, I.T. Kozlov, and S.G. Ashitko, All-Russian Scientific Research Institute of Petroleum Refining; UDC 665.6(470).001.7]

[Abstract] The former Soviet Union was always one of the world's leading petroleum exporters, and most of its proved oil reserves were located in Russia. In the mid-eighties, however, oil recovery in Russia began declining and will likely continue to decline until the end of the century. In the near future, Russia may thus anticipate an oil shortage. Because Russia had never experienced the oil crises encountered in many industrially developed countries, the development of energy-saving technologies and intensification of the degree to which oil is processed were never emphasized as in the West. At the beginning of the nineties, the depth of oil refining in Russia averaged just 65 percent versus 82-82 percent in developed countries. At the same time, many Russian petroleum products are inferior to their foreign counterparts from both ecological and performance standpoints. The use of leaded gasoline, in particular, is a serious ecological problem. Only 59 percent of diesel fuels produced in Russia may be classified as low-sulfur. Furnace residual fuel oil remains Russia's highest-volume petroleum product, and it accounts for 13-13.5 percent of the fuel used to produce electric power. The quality of motor, industrial, and transmission oils produced at Russian oil refineries is inferior to that of their foreign counterparts. Russian oil refining industry is capable only of meeting the fuel needs of its obsolete machine tool park, vehicle fleet, and inventory of mobile and stationary power generating units and is not equipped to handle the technological breakthroughs anticipated in such sectors. The technological structure of most of Russia's oil refineries cannot support production of the required amounts of products meeting current quality levels, much less future ones. The All-Russian Scientific Research Institute of Petroleum Refining has been collaborating with leading institutes in the different petroleum product-using sectors to develop the first scientifically substantiated forecast of Russia's future petroleum product needs. The forecast developed to date indicates a face-paced increase in the number of diesel-fueled motor vehicles and increases in the quantity and quality of high-octane gasolines. The following changes in Russia's production and utilization of petroleum products were recommended: increasing use of winter grades of diesel fuels until it accounts for 30 percent of all diesel fuels used, reducing the maximum sulfur content of diesel fuel used in vehicles driven in cities or areas of high air exchange from 0.2 to 0.05 percent, increasing the quality of other petroleum products such as bitumen and coke, and increasing the depth of oil refining to 72-75 percent within the next 5 years and to 82-85 percent within the next 20 years. Meeting these goals will require the construction of new complexes to process mazut into motor fuels and the redesign of existing facilities. The enormous capital investments required for such massive construction/reconstruction can only be achieved with adequate government support of the sector. Machine building-related R&D and facilities that have been freed up as a result of conversion could be used to construct modern facilities permitting deeper processing of petroleum, which could in turn reduce expenditures of foreign exchange on imported petroleum products. The government must protect the sector's scientific research institutes to keep them from disappearing; restore destroyed scientific complexes of scientific research institutes, affiliates, and pilot plants; and modernize the sector's scientific research and design institutes and link them with machine building plants in integrated complexes. Table 1.

Quality of Prospective Oils for Refining

947F0077B Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No. 9, Sep 93 pp 6-10

[Article by E.F. Kaminskiy, K.A. Demidenko, A.M. Bezhanidze, V.V. Barsukova, and N.M. Zhmykhova; UDC 553.982.2(470):665.6]

[Abstract] In the eighties, 30 to 35 new oil deposits were developed each year. Only seven were developed in 1990, and at present, more than 70 percent of proved oil reserves are now being developed. In 1992, the Russian Federation recovered 385 million tonnes of oil and gas condensate, which accounted for about 85 percent of all oil recovered in the CIS. Of all the oil recovered in the Russian Federation, 67.0 came from Western Siberia. An analysis of current and projected development of 11 oil deposits managed by the associations of the Glavtyumenneftegaz revealed that by the year 2000, oil recovery will increase at 6 of them. These six deposits are relatively small, however, and the increased oil recovery from them will not offset the decreases in oil recovery activity projected at the deposits of the Nizhnevartovsk, Megion, and Langepis associations. The association Nizhnevartovsk (the largest of the 11 associations) accounted for 19.8 percent of all oil recovered in 1993 and is projected to remain the leader in oil recovery through 1995 (accounting for 17.8 percent of the oil recovered. By 2000, however, it is projected to drop to third place behind the associations Yugansk and Surgut. The percentage of "rejuvenation" of the oil recovered by the associations Pur, Urengoy, Megion, and Krasnoleninsk has been calculated at about 40 percent, and a figure of 22 percent has been calculated for the region as a whole. The All-Russian Scientific Research Institute of Petroleum Refining has studied virtually all new deposits in Western Siberia. The following have been deemed the most interesting: Priobskaya (heavy with high sulfur and paraffin contents and a 45 percent maximum yield of light fractions, a valuable raw material for jet fuel, and interesting as a source for high-viscosity base oils and vacuum distillate for catalytic or hydrocracking; Kharampurskaya (heavy with a low sulfur content, high paraffin content, and 64 percent maximum yield of light fractions and promising as a source of gasoline with an octane number of 59, jet fuel, winter diesel fuel, and low-viscosity boiler fuel); Severno-Komsomolskaya (heavy with a high sulfur content, virtually free of gasoline fractions, and a source of components of jet and diesel fuels and low pour-point oils not requiring dewaxing); and Sugmutskaya (a high-sulfur, low-paraffin, high-potential oil that may with deep refining yield virtually all types of low-sulfur fuels and good-quality base oils). By the year 2000, the amount of high-sulfur oil produced by the Glavtyumenneftegas will increase from 52.5 to 55.2 percent; however, the mean-weighted content of sulfur in both high- and low-sulfur oils will decrease somewhat. The oil recovery situation is not nearly as serious in other areas of Russia as in Western Siberia. The most promising oils in the European part of Russia are the following recently discovered oils of the Timanovo-Pechorsk region and the shelves of the Baltic, White, Barents, and Okhotsk seas: Kharyaginskaya (a paraffin content of 21 percent, a possible source of jet fuel, and potential 19.4 percent content of base oils with a viscosity index of 98), Peschanoozerskaya (low-sulfur, 84 percent content of light fractions to 350°C, and source of TS-1 jet fuel and summer and winter diesel fuels with a viscosity index of 99), Kaliningradskaya, and Sakhalinskaya. Tables 5.

Synthetic Zeolites and Zeolite Catalysis in Oil Refining and Petrochemistry

947F0077C Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No. 9, Sep 93 pp 14-18

[Article by B.K. Nefedov, T.V. Alekseyeva, and I.Ye. Gorbatkina, All-Russian Scientific Research Institute of Petroleum Refining; UDC 549.67+[66.097:665.6]

[Abstract] Synthetic zeolites are porous crystalline aluminosilicates of alkaline or alkaline earth metals with a strictly regular pore size and unique adsorption and catalytic properties. The All-Russian Scientific Research Institute of Petroleum Refining [VNIINP] has been researching the conditions of synthesizing different types of zeolites and zeolite production processes since the 1960s. The VNIINP has recently developed promising processes for producing type Y zeolites. A no-waste process has been developed to synthesize NaY zeolite that entails producing the silica needed to synthesize the zeolite by electrodialysis of a sodium silicate solution and then using the alkaline solutions formed during electrodialysis and crystallization to dissolve the silicate materials for return to the production process. Other studies performed at the VNIINP resulted in the establishment of six general laws governing crystallization of pentacyls of the TsVK series that were in turn used to develop a method of synthesizing zeolites with 100 percent phase purity. In 1989-1990, the VNIINP developed a no-waste process for producing pentacyls with a very low ($\leq$0.1 weight percent) sodium oxide content, i.e., TsVN zeolites, according to which the mother liquors are returned to the process in the stage of preparing the starting reaction mixture. Working jointly with Byelarus Technological Institute, the VNIINP synthesized molecular sieves with different structures: $AlPO_4$-5, $AlPO_4$-20, $AlPO_4$-44, SAPO-5, SAPO-44, etc. Catalysts based on them are now being tested. The wide-pore sieves $AlPO_4$-5 and SAPO-5 have shown the most promise and highest stability: They do not break down when heated up to 1,040°C or when treated with steam at 600°C. Both sieves also have rather high sorption volumes. Modified TsVM and TsVK-XI zeolites have been used as a basis for developing the catalyst SGK-1m for dewaxing the base of I-20A and I-12A industrial oils and the heavy oil distillates used as a base for ASV-5 high-viscosity motor oil. The catalyst SGK-1R has been developed for single-stage hydrorefining of highly aromatized catalytic cracking gas oils. New processes have also been developed for two-stage hydrocracking of vacuum distillate at a pressure of 15 MPa to produce jet fuel and for light hydrocracking at a pressure of 5-7 MPa to produce diesel fuel. The new process has been used to create the zeolite-containing catalysts NMG-70 and GKO-1. A series of zeolite-containing catalysts has also been developed for light hydrocracking of vacuum distillate with a transformation depth of more than 70 percent. The zeolite RZEU is used as a splitting component. Catalysts of the series GKR consisting of 40 percent RZEU possess good splitting activity but are not selective enough with respect to the diesel fuel fraction. Catalysts of the series LGK are more active and selective than their rival counterpart ZMAG 95 AS produced by Haldor Topso. Tables 10; references 31 (Russian).

On Diversification of Ukraine's Gas Supply Sources

947F0072A Kiev NAFTOVA I GAZOVA PROMYSLOVIST in Ukrainian No. 3, 1993 pp 2-4

[Article by Z.P. Osinchuk, VO (production association "Ukrgazprom")]

[Abstract]Like several other countries of Western Europe Ukraine does not possess sufficient energy sources. However, unlike the former, the Ukraine meets most of its demand (up to 80% in 1990-1992) by importing gas from only two places) Russia and Turkmenistan. Ukraine's energy consumption per capita is around 6.5 tonnes of equivalent fuel. Energy consumption per $1 of GDP is 4 to 6 times higher than in the USA, Western Europe and Japan. Natural gas consumption for 2000-2010 is forecast at 70 to 80 billion m^3 a year. The article lists possible sources that could satisfy the demand more efficient utilization of Ukraine's gas resources; the use of nontraditional sources; receiving gas as payment for the use of Ukraine's gas pipeline system by Russia, Turkmenistan and other countries; buying gas from the Russian Federation, which makes economic sense for both Russia and Ukraine; buying natural gas from Turkmenistan, Kazakhstan, Uzbekistan, Iran, Algeria, Norway and Netherlands; and buying liquefied natural gas from Algeria, Libya, Qatar, Nigeria and other countries. Ukraine could also use her intellectual and industrial potential and participate in projects of exploitation of natural gas fields in other countries and transporting the gas via Ukraine. Diversification of gas supply sources will create necessary conditions for reliable and safe functioning of the national economy of Ukraine. Figures 1, tables 1, references 6: 1 Ukrainian, 5 Western.

Main Problems of Oil and Gas Geophysics in Ukraine

947F0072B Kiev NAFTOVA I GAZOVA PROMYSLOVIST in Ukrainian No. 3, 1993 pp 5-7

[Article by General Director, DGP [State geophysics enterprise] "Ukrgeofizyka", M.V. Kivshyk under the "Oil and Gas Geology" rubric

[Abstract] Problems of geophysics are closely related to the extremely urgent problem of increasing oil and gas reserves in Ukraine. The current status of geophysical methods for oil and gas prospecting in Ukraine has been determined to a large degree by the status of geophysical service in Ukraine within the former Soviet Union and the level of geophysics in the latter. As a result, in terms of geophysical instrument building and geophysics technology Ukraine is lagging substantially behind highly developed countries. This becomes clear from the comparison of technical and technological means used in Ukraine and in the West. For instance, equipment for recording seismic information can record information in 48 or 96 channels at a time, whereas equipment used in the West and USA can record information in 960 channels plus. The best computers used in Ukraine for processing geophysical information have an 8 MB RAm, 2-4 GB hard disk and operate at 2 million operations per second, while in the West these parameters are 80-100 MB, 12-16 GB and 100 million operations per second, respectively. The use of personal computers in Ukraine is in its initial stage due to the lack of money for buying them. Oil and gas geophysics in Ukraine is in critical state. Immediate retooling of geophysical operations in Ukraine is mandatory. The author suggests measures aimed at solving this problem.

New Object of Oil and Gas Field Prospecting in Ukraine

947F0072C Kiev NAFTOVA I GAZOVA PROMYSLOVIST in Ukrainian No. 3, 1993 pp 8-11

[Article by V.V. Krot (Derzhkomgeologiyi Ukrayiny [State Committee of Ukraine on Geology]), Ye.S. Dvoryanin (DGP "Ukrgeofizyka"), P.T. Pavlenko (DGP "Poltavanaftogazgeologiya") and V.P. Klochko (IGN [Geological Sciences Institute], AN Ukrayiny [Academy of Sciences of Ukraine]); UDC 553.98:550.8(477)]

[Abstract] At the present time Ukraine needs new directions of low depth oil and gas prospecting. A new nontraditional object of geological prospecting wherein efficient increase of oil and gas supply does not depend on foreign investment was proposed. The authors had been able to discover and justify scientifically a unique object for prospecting for hydrocarbons within the main oil and gas producing region of Ukraine the Northern Board of the Dnieper-Donets Depression (DDD). The work was conducted in accordance with the "Integrated Program for Studying Prospects of Oil and Gas Capacity of the Crystalline Foundation of the Northern Board of the Dnieper-Donets Depression in 1989-1995" that was approved in 1988. A 1991 forecast estimated that resources of hydrocarbons were equal to 186 million tons. The Program was actually implemented in only three years. New methods and procedures for trap detection and preparation, forecasting etc. had been developed. New oil and gas-containing areas were discovered. A non-standard set of geophysical studies had been developed, which resulted in highly efficient geological prospecting. Ten new oil and gas fields were discovered, and gas capacity in two other zones was established. Industrial-size accumulations of hydrocarbons were detected in areas that before had been considered non-promising. According to current estimates hydrocarbon resources in these areas exceed 250 million tonnes. References 6, all Russian.

Pulsed Technology of Multipurpose Protection and Methods for Using It for Fire Fighting and Liquidation of Results of Accidents and Catastrophes

947F0072D Kiev NAFTOVA I GAZOVA PROMYSLOVIST in Ukrainian No. 3, 1993 pp 48-54

[Article by V.D. Zakhmatov (Problems of Material Science Institute), AN Ukrayiny; UDC 654.924.5]

[Abstract] The development of a considerable industrial potential, particularly in oil and gas production, transport and consumption, has led to uncontrolled ecological catastrophes comparable to catastrophes caused by wars. The current protection technology is inefficient, poorly yields itself to control and inadequate to the scope of destruction factors. Mechanisms of pulsed detonation feeding and sputtering of powders and liquids for fire extinguishing,

setting up light and heat protection screens in order to prevent explosions, and spraying of binding coatings are being studied at the Problems of Material Science Institute of the Academy of Sciences of Ukraine. Key propositions of the theory of pulsed protective action have been developed. A number of pulse devices have been built and tested at test sites under close to real-life conditions. A multibarrel unit that periodically creates gas-dispersed streams with controlled parameters comprise the most powerful pulsed system. The units are mounted on tank chassis (50 barrels), gun carriages (9, 16 or 25 barrels) or on skids (4, 7, 8 or 9 barrels). An important advantage of a multibarrel unit is the capability to push and spray any granular powders, liquids and viscous substances. The article presents test results of various units. Simple explosive devices and fire extinguishing bombs also have been developed and tested. Multibarrel units can be effectively used for fighting forest fires, as well as fires at oil and gas installations and chemical industry enterprises, fires that can happen at airports during emergency landing of an aircraft, and ship fires caused by spilled petroleum products. Figures 4.

INDUSTRIAL ENGINEERING

Methods of Raising Sunken Objects by Using Lifting Modules Made of Hollow Fillers

947F0076A Moscow SUDOSTROYENIYE in Russian No. 10, Oct 93 pp

[Article by B.A. Bugayenko and A.F. Gal; UDC 629.129.2]

[Abstract] A new principle has been proposed for raising sunken objects by means of precisely manufactured hollow ceramic or glass spherical elements that have relatively large diameters and that are formed into modules with a lifting force ranging from 1 to 10 tonnes or more. The new method and flotation devices, which were developed at the Nikolayevsk Shipbuilding Institute, offer the following advantages: reliability and simplicity of distributing the lifting forces required along the hull of a sunken object lying at great depths thanks to the use of individual modules capable of withstanding significant pressures and conventional cables to attach the lifting modules to the sunken object; simplicity of regulating forces and executing the operations of eliminating list and trim by varying the number of lifting modules and by rational distribution of the sites at which they are attached to the sunken object; high degree of mechanization of the operations entailed in the lifting process; and achievement of the required lifting speed thanks to a combined lifting technique where most of the lifting forces are created by underwater modules and the rest are created by hoisting mechanisms tied to the sunken object by cable; improvement of the technological level of lifting thanks to a reduction in the size and numbers of ropes in the winding tackle systems used as additional lifting equipment; reduction of the installed capacity of the lowering and raising equipment thanks to the fact that the lifting modules are attached to the sunken object one after the other rather than simultaneously; and no stringent requirements regarding positioning the vessels involved in lifting the sunken object. The new lifting modules filled with spherical ceramic fillers with an aggregate density of 359 kg/m^3 have been manufactured and tested. The first has a lifting force of 10 kN, weighs 573 kg, and has a volume of 1.60 m^3 and overall dimensions of 1.13 x 1.25 x 1.13 m. The second has a lifting force of 50 kN, weighs 2,861 kg, and has a volume of 7.97 m^3 and overall dimensions of 1.93 x 2.14 x 1.93 m, and the third has a lifting force of 100 kN, weighs 5,702 kg, and has a volume of 15.88 m^3 and overall dimensions of 2.93 x 2.69 x 2.93 m. Figures 6, table 1; references 6 (Russian).

Analysis of the Dynamics of a Shaft Line With Rigid and Elastic Deadwood Bearings

947F0086A Moscow PROBLEMY MASHINOSTROYENIYA I NADEZHNOSTI MASHIN in Russian No. 1, 1994 (manuscript received 13 Apr 92) pp 25-30

[Article by A. S. Kelzon, N. V. Yanvarev, V. G. Muramovich, St. Petersburg; UDC 629.12.037.6]

[Abstract] A shaft line with a mass distribution featuring a suspended mass on two supports one of which is pliable is mathematically modeled to examine the effect of the rigidity of the pliable support on the dynamic characteristics of a propeller shaft-stern deadwood bearing system. The dynamics of the shaft drive on the Arktika nuclear icebreaker are calculated using this model. It was found that as the capacity of icebreaker power plants increases, the amount of vibrations in the stern end of the hull becomes untenable, and leads to fatigue cracks and damage to the deadwood bearings. The energy of the interaction of the propeller and the ice must be optimally distributed. Two cases are examined: 1) a single impact of the propeller blade with the ice and transition processes in the shaft line caused by the impact; 2) induced transverse vibrations of the shaft line due to a periodic pulse load caused by the interaction of the propeller with the ice. The optimal rigidity of the deadwood bearing support is 150 MN/m. The problem of determining the rigidity parameters of the supports of the deadwood bearings should be solved by optimizing the bearing parameters in each case using supports with an adjustable rigidity, which makes it possible to adjust them away from the critical frequency over the entire range of frequencies of rotation of the propeller shaft. Figures 5; references 4 (Russian)

Properties of Turbine Blade Ceramic Coatings Obtained With Electron-Beam Technology

947F0086B Moscow PROBLEMY MASHINOSTROYENIYA I NADEZHNOSTI MASHIN in Russian No. 1, 1994 (manuscript received 28 Sep 93) pp 74-80

[Article by Yu. A. Tamarin, Ye. B. Kachanov, S. V. Zherzdev, Moscow; UDC 629.7.023.22]

[Abstract] This paper examines the creation of condensed heat-resistant coatings for cooled working blades of the gas turbines of aviation engines and energy plants. The evaporation of ZnO_2-V_2O_3 ceramics are studied and a coating with a columnar structure is formed. The basic thermophysical properties of ceramic coatings are studied. Ceramic condensed coatings are highly resistant to thermal loads and were not damaged during prolonged tests on aviation engines. The coatings protect blade surfaces from high-temperature corrosion and the blade material from weakening due to high temperatures. The characteristics of ceramic coatings in general are listed. Two ceramics were tested, KDP-1 and KDP-4. The conductivity of KDP-1 was close to that of a ZrO_2 single crystal. The main cause of coating failure is oxidation of the ceramic-metal interface; other causes are listed. The oxidation causes a continuous reduction in the adhesion of the ceramic coating. This may be reduced by alloying and reducing the diffusive mobilty of oxygen. At temperatures below 1100° the coatings may last 10,000-15,000 hours. Figures 4; tables 3; references 4: 3 Russian, 1 Western.

MECHANICS OF GASES, LIQUIDS, AND SOLIDS

Cumulation of a Flat Shock Wave in a Tube by a Thin Parietal Gas Layer of Lower Density

947F0087 Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol. 65 No. 3, 1993 (manuscript received 31 Jun 92) pp 302-305

[Article by V. I. Bergelson, I. V. Nemchinov, T. I. Orlova, V. M. Khazins; UDC 533.6.011]

[Abstract] This paper presents a numerical analysis of a new effect of shock wave focusing which is caused by a thin extended gas layer of lower density at the side wall of a cylindrical tube when a wave is reflected from the flat end of the tube. The gas layer is in front of the shock wave and normal to the wave. It is shown in a model (using Euler equations and an antidiffusion scheme) that the gas dynamic parameters in the vicinity of the center of the end face increase by a factor of 5-10 (for strong shock waves) compared to the parameters trailing a reflected stationary flat shock wave. The diffuse gas layer may form naturally due to heating by heat fluxes from the front of a strong shock wave, or may be formed artificially by heating the surface. An isobar figure illustrates shock wave configuation and currents behind the shock wave just after it is reflected from the end of the tube. The increased pressure is a local and short-lived effect, but it is strong. Large-scale eddies are formed after the shock wave is reflected. The effect must be experimentally verified. Figures 5; references 8: 6 Russian, 2 Western.

Geochemical Problems of Chernobyl Radionuclides

947N0034A Kiev GEOLOGICHESKIY ZHURNAL in Russian No. 5, May 93 (manuscript received 12 Apr 93) pp 11-15

[Article by E. V. Sobotovich, Geochemistry, Mineralogy and Ore Formation Institute, Ukrainian Academy of Sciences, Kiev; UDC [550.4:621.039.7]:504.064.36(477.41)]

[Abstract] The characteristics of the physicochemical state of the radionuclides discharged in the Chernobyl accident are examined. The reasons for variations in the forms of presence of radioactive fallout over the territory of the Ukraine are discussed, as well as the mechanisms causing a change in mobility of radionuclides with time under different landscape-geochemical conditions. The processes of natural self-purification of territories from radioactive pollutants are evaluated, followed by a prediction of radiation conditions over the polluted territories for a period from 5 to 1000 years. The following are among the phenomena observed in the considered area. There is a multisided dynamics of the vertical migration of radionuclides in ground and soil horizons related to changes in the mobility of radionuclides. There is a considerable nonuniformity in the distribution of radioactivity in samples of soils, plants, water, bottom deposits and hydrobionts. There is fractionation of radionuclides in the fluvial network caused by the forms of entry of nuclides and their different physicochemical properties. There is active destruction of fuel particles and conversion of radionuclides into migratory forms. There is a nonuniformity in the distribution of radionuclides expressed in a difference in the dose loads by an order of magnitude for biosystems even in small test areas within the 30-km critical zone and beyond its limits. Under conditions of explosive discharge of radionuclides there is a great difference in the accumulation factors for the very same plants in different regions. Considerable redistributions of radionuclides are found in the system of Dnepr reservoirs and the Black Sea. Mathematical simulation made it possible to organize a databank for predicting the dynamics of radionuclide pollution of soils, water and bottom deposits. Dynamic models were constructed for estimating the formation of radionuclide pollution doses for the people living in regions with an increased content of radionuclides. The accumulated experience shows that the results of geochemical research are fundamental in solving technical, agroindustrial and biomedical problems. On the basis of these and other findings a list of problems in the field of geochemistry of radionuclides which must solved in the near future is given.

Choice of Parameters for Process of Thermal Destruction of Chlororganic Toxic Wastes

947N0035A Kiev EKOTEKHNOLOGII I RESURSOSBEREZHENIYE in Russian No. 6, Nov-Dec 93 (manuscript received 22 June 93) pp 42-47

[Article by I. N. Karp, V. Ya. Konyukh, V. V. Chetverikov, Ye. P. Martsevoy and N. N. Grinchenko, Gas Institute, Ukrainian Academy of Sciences, Kiev; UDC 577.4:537.521.1:66.092.9]

[Abstract] A method is proposed for choosing the parameters for a process for the thermal destruction of toxic chlororganic wastes using the maximum admissible concentration (MAC) of discharge of nondecomposing and secondary toxic compounds. Successive procedures are outlined for choosing the parameters for this process of destruction of chlororganic wastes. The required degree of destruction of the initial toxic substance is determined on the basis of the MAC. The H/Cl ratio in the toxic substance is used in determining the composition of the heat carrier ensuring the bonding of chlorine in the destruction products. Computed data are given on the necessary degree of destruction for the most typical chlororganic wastes and the results of thermodynamic computations of the quantity of toxic products of destruction as a function of process temperature and composition of the heat carrier are presented. The feasibility of using E-plasmotrons as generators of a high-temperature medium for the thermal destruction of chlororganic toxic wastes is validated. Instead of large stationary plants it is deemed essential that small mobile apparatus be used, constructed on the modular principle so that one module can be replaced by another for accommodation to changing physicochemical properties of the wastes. Figures 3; references 7: 3 Russian, 4 Western.

Method for Utilizing Sewage Sediments With Increased Content of Heavy Metals

947N0035B Kiev EKOTEKHNOLOGII I RESURSOSBEREZHENIYE in Russian No. 6, Nov-Dec 93 (manuscript received 9 Mar 93) pp 54-57

[Article by V. G. Petrov, Ye. S. Makhniyev and V. P. Semakin, Applied Mechanics Institute, Russian Academy of Sciences, Izhevsk; UDC 669.054.8:628.3]

[Abstract] A high content of heavy metals in sewage is characteristic for all major industrial centers (data for Moscow, Riga, Ryazan, Izhevsk and Chelyabinsk are given). It is essential that these be removed and currently employed methods are inefficient and inadequate. A method is therefore proposed for the utilization of the sewage sediments with a high content of heavy metals using acid reagents (sulfuric and nitric acids). The optimum time and temperature regimes of the process are determined. The developed method, which was tested in large samples of sediment from various cities, makes it possible to eliminate 95-100% of all metals. The purified sediment, after the neutralization of residual acidity, is processed into organomineral fertilizer; a table gives the content of nutrients in comparison with some other organic fertilizers. Another table shows that the residual content of heavy metals in the purified sediment is below the norms stipulated for this type of fertilizers in other countries (United States, Germany, Netherlands, Switzerland). The separated metals (such as zinc, nickel, copper and chromium) are relatively easily reworked into concentrates and are used in the preparation of construction materials which are of value in industry. Concentrates of chromium and nonferrous metals are then suitable as raw material in manufacturing processes. The resulting products, completely waste-free, are ecologically safe. Figure 1; references 8: 6 Russian, 2 Western.

Constraints on Parameters of Theoretical Model of Motion of Trial Bodies in Satellite Experiment for Refining Value of Gravitational Constant

947N0032A Moscow IZMERITELNAYA TEKHNIKA in Russian No. 12, Dec 93 pp 3-6

[Article by A. V. Osipova; UDC 528.27]

[Abstract] Among the principal fundamental physical constants it is the Newton gravitational constant G which is least precisely determined. The other constants are known with an error not greater than 1×10^{-6}, but the most optimistic estimate of the error in determining G is 1×10^{-4}. Despite the innumerable studies of G, there is still no explanation for the strong discrepancies between the results of multiple determinations of G even with repeated determinations by the same experimental method. In an attempt to introduce clarity into this problem, an analysis was made of the constraints on a theoretical model of representation of the relative motion of trial gravitationally interacting bodies on an artificial satellite which result in a low systematic error level and provide a possibility for refining the gravitational constant from measurements of the relative motion by two orders of magnitude. Constraints related to the neglecting in the theoretical model of relativistic corrections to the description of the Earth's gravity field, neglecting of the zonal harmonics of expansion of the Earth's gravitational potential beginning with a harmonic of some particular number and influence of lunar and solar tidal potentials are examined. The results clearly indicate that considerable discrepancies in the results of large series of G determinations in surface laboratory experiments may occur as a result of the inadequacy of the used theoretical model. [The satellite experiment referred to in the analysis was described by A. J. Sanders, et al., PHYS. REV. D, Vol. 26, p 489, 1992.] Figures 2, references 16: 7 Russian, 9 Western.

Cloud Cover Reaction to Nuclear Tests

947N0048A Moscow FIZIKA ZEMLI in Russian No. 1, Jan 94 (manuscript received 27 Jul 93) pp 89-90

[Article by L. I. Morozova, Geology and Geophysics Institute, Uzbek Academy of Sciences; UDC 551.590.2]

[Abstract] The dynamics of appearance of linear cloud elements over faults after nuclear explosions at test sites in Kazakhstan and in China in 1988, 1989 and 1990 is examined. The study involved an analysis of NOAA meteorological space photographs at 1:25 000 000. A seismotectonic approach was used as the basis for this research. During this period there were ten nuclear tests in Kazakhstan and two in China. The distance between these test sites was 1200 km. In three cases there were no cloud lineaments because it was clear weather, in a fourth case there was a negative result, but in the other six cases, each of which is described in detail, there was a significant correlation between the nuclear shots and presence of cloud lineaments. A comparison of the times of appearance of cloud lineaments after explosions in Kazakhstan and China shows that in China the atmospheric reaction to the explosions began earlier—after eight minutes and after three hours, whereas in Kazakhstan it was after four hours. Cloud lineaments did not appear over the Kazakh test site on the first space photographs after a nuclear explosion. This is possibly not because of atmospheric conditions, but because of different crustal viscosity and elasticity. A figure accompanying the text shows the propagation of disturbances along faults from the test sites. The energy of the Semipalatinsk shots is propagated over an area of 300 000 square kilometers, whereas that from the Chinese shots extends over an area of 200 000 square kilometers. It is concluded that the propagation of disturbances from nuclear explosions can be traced along faults from the dynamics of the linear cloud anomalies above the latter. Figure 1; references 2: 1 Russian, 1 Western.

Code of Ethics for Earthquake Prediction

947N0048B Moscow FIZIKA ZEMLI in Russian No. 1, Jan 94 pp 91-93

[Article by G. A. Sobolev, A. D. Zavyalov and Ye. N. Sedova; UDC 550.343(009)]

[Abstract] When a short-range prediction of an earthquake becomes known to the public it may result in panic and urgent measures by the government become especially urgent. Especially since the Armenian earthquake there has been improper dissemination of earthquake warnings by the press and some specialists, many of the latter working outside the field of their competence. This includes astronomers, specialists in biofields, those with extrasensory perception and amateurs. Among the seven hundred such predictions reviewed by an expert group not one of them proved valid. Several specialists are named who have been exceptionally active in making and disseminating alarming and unwarranted predictions. This also happens in other countries. This problem was dealt with in two resolutions of the 22d General Assembly of the European Seismological Commission (Barcelona, 20 September 1990) calling for a moratorium on such not fully validated predictions and calling for a code of ethics for those issuing such warnings. Such a code was adopted at Strasbourg on 18 October 1991 (the Russian text of this code, as well as that of the two mentioned resolutions, is given). It is requested that all who make such predictions in Russia direct them for review to: Nauchno-inzhenernyy i koordinatsionnyy seysmologicheskiy tsentr RAN (Scientific Engineering and Coordinating Seismological Center, Russian Academy of Sciences), Moskva, ul. Ulyanovskaya, 51. References 6: 3 Russian, 3 Western.

Origin of Anomalous Ultra-Low Frequency Geomagnetic Field Disturbances Prior to the Loma Prieta Earthquake

947N0039 Moscow FIZIKA ZEMLI in Russian No. 2, Feb 94 (manuscript received 14 Dec 92) pp 19-24

[Article by N. I. Gershenzon, M. B. Gokhberg, Unified Institute of Earth Physics, Russian Academy of Sciences; UDC 550.385.46:550.343]

[Abstract] Variations of the geomagnetic field at 0.01-10 Hz recorded at the epicenter of the Loma Prieta earthquake (M = 7.1) may be explained by a set of electric dipoles which appear due to a change in the pore liquid pressure near faults 0.1-10 m in size. It is sufficient for these sources to arise in a narrow water-bearing stratum

(about 10 m) near the surface (10-100 m deep). The magnitude of the effect depends heavily on the size of faults, frequency, and the depth of bedding of the layer, and to a lesser extent, on the expanse of the layer, conductivity, and the number of faults. Anomalies were recorded more than a month before the earthquake, but the most powerful anomalies began three hours before the earthquake in the 0.01-0.4 Hz range and exceeded the background by two orders of magnitude. The model presented here is based on pulse processes of fault formation in the Earth's crust, which cause disturbances in a wide range of frequencies, including he ULF range. In this range electrokinetic and piezomagnetic effects are predominant. However, the piezomagnetic field does not match observations in magnitude or frequency. Electrokinetic effects agree satisfactorily with experimental data. The model presented here can determine parameters of the fault formation process, the size distribution of faults, and the rate of appearance. Figures 2; table 1; references 11: 5 Russian, 6 Western.

Astrogeodetic Network at Beginning of Third Millennium

947N0033A Moscow GEODEZIYA I KARTOGRAFIYA in Russian No. 3, Mar 93 pp 25-28

[Article by M. M. Mashimov; UDC 528.33]

[Abstract] As the end of the 20th century approaches and the new century is in the offing, there is a wide array of problems which must be dealt with in order to solve problems in astrogeodesy, geodynamics and cartography. These include organization of a planetary geocentric coordinate system, a global position system and a VLBI network; study of the figure, physical fields and internal structure of the Earth with allowance for their secular, long- and short-period changes with time; determination of an inertial coordinate reference system, parameters of rotation of the Earth and polar movement; study of the figures and physical fields of the moon, planets and their satellites and defining coordinate reference systems for the Moon, Venus, Mars and other planets; determination of the center of inertia of the Earth-Moon system for the epoch; organization of state astrogeodetic, geodetic, gravimetric and vertical control networks; organization of special- purpose local, sea and space geodetic networks; tie-in of different coordinate systems and physical fields; astrogeodetic, gravimetric and cartographic support for astroengineering programs in near and distant space; astrogeodetic, gravimetric and cartographic support for study of crustal movements, lithospheric plates and the continents, changes in sea level and the world ocean, prediction of earthquakes, volcanic eruptions and catastrophes of different types; monitoring of natural and technogenic environments; implementation of land, sea and aerospace surveys; production of graphic, digital and electronic topographic and thematic maps. These problems cannot be solved without the coordination of long-term scientific and technical programs in the field of astrogeodesy, geodynamics and cartography during 1995-2010 by the academies of sciences of the CIS and Rosgosstandard. The article discusses the organization of a network of astrogeodetic observatories (AGO) for uniformly covering the entire area of the country and the requirements on a new highly accurate fundamental astrogeodetic network, without which work on the enumerated problems is without promise. The work of the AGO, on which the entire network hinges, also is described, as is the role played by GLONASS, Navstar and Lageos satellites. Work already done and that which is planned is outlined. How the basic system and its subsystems will allow solution of key problems is discussed.

Prospects and Problems in Remote Sensing of Earth

947N0033B Moscow GEODEZIYA I KARTOGRAFIYA in Russian No. 3, Mar 93 pp 40-44

[Article by Ye. A. Reshetov, A. B. Karasev and G. A. Savin; UDC 528.711.1.(15)]

[Abstract] Remote sensing activities in Russia are reviewed. Past achievements are summarized and the ongoing work is discussed in detail. The collection and sale of remote sensing data constitute a potential source of foreign exchange and it is the intention to make these materials available on the world market. Collaboration with the developing countries will also be stressed. However, the even more important role played by remote sensing materials in the development of the Russian economy is emphasized (exploration for mineral resources, environmental protection, etc.). The following are regarded as the immediate objectives in the field of development of detailed observation subsystems: modernization of the Resurs-FI and Resurs-FII satellites (1994-1996) for increasing their technical-economic efficiency by improving resolution on the ground by 20-40%, increasing the area of the survey from one vehicle and lengthening its lifetime; activation (1993-1994) of a new vehicle of the Resurs-F series with a ground resolution better than 5 m; flight tests (1996-1997) of a new vehicle of the Resurs-F series which will replace the Resurs-FI and F-II (work on creating the new vehicle is being funded by the Russian Space Agency); adaptation of the information received from the new vehicles to the tasks of different departments; modernization of the surface complex for the interbranch processing of information to a level which will make it possible to draw a wide range of Russian entrepreneurs into the subsequent processing and application of the results; development and introduction of technologies for the digital processing of satellite images within the framework of geoinformation systems for the production of precise cartographic materials oriented on the needs of planning and control agencies, search for and evaluation of natural resources and environmental monitoring. Russia must be prepared for active participation in the international satellite information market. The Russian government and companies, especially the Priroda State Center, are ready to cooperate with companies in other countries in marketing of products developed using Russian remote sensing systems.

Problems in National Map Production in Modern Stage

947N0033C Moscow GEODEZIYA I KARTOGRAFIYA in Russian No. 3, Mar 93 pp 44-49

[Article by I. I. Maksimov and A. N. Panin; UDC 528.92]

[Abstract] After reviewing the past accomplishments of the Russian mapping industry, the technical and organizational deficiencies are critically assessed. The latter include a low quality of polygraphic reproduction of compilations of maps and atlases, narrow specialization of cartographic enterprises, antiquated technology of many processes and a great lag in automation of time-consuming processes. These and other problems have been seriously aggravated by the political breakup of the former USSR because prior to 1992 60% of the map production needs of the Russian Federation was met in the former union republics, with some of the most modern facilities being constructed there. Only 23.7% of the map production capabilities remained inside Russia and these facilities lacked the equipment to produce a wide assortment of cartographic products. The drawing of new boundaries and the renaming of hundreds of places is meanwhile imposing an enormous demand for immediate revision of hundreds of maps. Some of the efforts to upgrade Russian cartographic enterprises are specifically mentioned. During the last several years even the existing map production plants have been underloaded due to the unavailability of map compilations which have been retained at enterprises outside Russia not being returned despite agreements to do so. The new names of cities, the new boundaries of countries, all are in many cases not finalized, making for map production problems. The system by which plants pay for materials and the plants receive payment for their products has seriously complicated the process and all these factors have resulted in a severe drop in map production. Production has also been impeded by the shortage or low quality of paper, ink, offset plates and countless other materials. Against this discouraging background, the need for cartographic products is increasing rather than diminishing. An ambitious program is outlined, including production of a new edition of the famed Atlas of the World. If all goes well, the map production requirements should be fulfilled by the year 2000.

Digital Mapping and Geoinformation Systems

947N0033D Moscow GEODEZIYA I KARTOGRAFIYA in Russian No. 3, Mar 93 pp 49-51

[Article by V. N. Aleksandrov; UDC 528.93:516]

[Abstract] Traditional mapping, data collection and processing must give way to computerization and far-reaching automation in order to meet the modern needs of the Russian economy. Geoinformation systems are a point of departure and this concept must be further developed; in particular, integrated regional geoinformation systems are needed. One aspect of related work is digital mapping. In 1992 a federal digital mapping program was organized in Russia which was collated with 28 ministries and departments. It is planned that in 1994 work will be completed on the preparation of digital maps at 1:100 000 for the whole of Russia and by 1994-1996 the same will be done at 1:200 000 for the most important regions. There is a real market for these maps. In the future it is planned that topographic maps at all scales will be converted to digital form. All this will facilitate automation of processes involved in the production of thematic and special maps. The same procedure will be applied in urban and land surveys. These are but the first steps, for example, in ensuring effective ecological monitoring and territorial inventorying of natural resources. The maintenance of regional databanks is a priority task, revision must be on a frequent basis and an ever-increasing number of procedures must be automated. The many related problems involved are discussed. The introduction of geoinformation systems must proceed on an accelerated basis, accompanied by an increase in the productivity of labor by a factor of 5-7. Digital cartographic information must be organized and managed by federal agencies with long-term funding and a uniform quality control must be introduced and implemented. The information system must be organized on the basis of a decentralized model which takes into account the participation of all interested organizations in use of this information and all users must have equal access.

Possible Ionospheric Precursor of Earthquakes

947N0045A Moscow FIZIKA ZEMLI in Russian No. 3, Mar 94 (manuscript received 20 Jan 93) pp 37-44

[Article by V. P. Kim, V. V. Khegay and P. V. [illegible]-Svitych, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, Russian Academy of Sciences; UDC 550.510.535]

[Abstract] Computations were made of the penetration of an electrostatic field of seismic origin into the ionosphere for the case of a Gaussian distribution of the vertical electric field E_z at the Earth's surface in the epicentral region of an impending earthquake. It was found that the effectiveness of field penetration at nighttime is far greater than during the daytime and is highly dependent on the extent of the region of localization of the vertical E_z field. The strength of the electrostatic field at ionospheric altitudes has an appreciable value $\approx$ 0.3-0.7 mV/m only for large-scale seismic sources ($a \geq 100$ km) under the condition that $|E_z|$ at the epicenter is $\approx$ 1000 V/m. A study of the effect of the electric field of a seismic source on the background ionosphere also was made. The greatest effect is observed in the middle part of the nighttime E layer where the Pedersen drift of ions is maximum. The nature of the ionospheric disturbance is determined by the direction of E_z. With positive E_z the electron concentration experiences an appreciable decrease over the region of localization of E_z and when the E_z field is directed downward there is an increase in N_e. The degree of ionospheric disturbance is determined by the $|E_z|$ value at the epicenter and the extent of localization of the E_z region. Figures 4, references 8: 5 Russian, 3 Western.

Space-Time Variability of the North Atlantic Sea Surface Temperature Field

947N0036A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No. 3, Mar 94 (manuscript received 7 Oct 93) pp 82-90

[Article by V. V. Yefimov and A. V. Prusov, Sea Hydrophysical Institute, Ukrainian Academy of Sciences; UDC 551.526:551.513 (261.1)]

[Abstract] Sea surface temperature in the North Atlantic, the severity of winters in the northern hemisphere, and the position of the intertropical convergence zone were analyzed to reveal trends. It was found, for example, that anomalously large shifts in the zone preceded anomalously warm winters in the U.S., and anomalously small shifts preceded cold winters. Low-frequency variability of sea surface temperature was determined from 34 years of data. Data filtering and normalization procedures are described. Low-frequency variability of the surface temperature of the North Atlantic demonstrates a significant spatial variability (up to 2°C) which is probably linked with the variability of ocean circulation. Two types of remote links between the sea surface temperature and meridional motion of the intertropical convergence zone on interannual scales are found, and these appear to be related to quasi-stable atmospheric anomalies. The local interaction of ocean and atmosphere is probably dominant in the generation of quasi-stable sea surface temperature anomalies (as opposed to horizontal advective heat transfer by ocean currents), but this conclusion requires further confirmation. Figures 5, references 15: 5 Russian, 10 Western.

On-Line Scheme for Long-Range Prediction of Water Temperature in North Atlantic

947N0051A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No. 4, Apr 94 (manuscript received 25 Nov 93) pp 72-77

[Article by Ye. S. Nesterov, RF Hydrometeorological Scientific Research Center; UDC 551.465.632:551.509.33 (261.1)]

[Abstract] The long-range prediction of ocean surface temperature anomalies (OSTA) in individual regions of the North Atlantic by use of the group analogues (GRAN) method is described. Such a prediction can be made in either a categorical or a probabilistic form. The "Prognoz" on-line databank of the Russian Hydrometeorological Center was used as the data source, especially the ROWS database containing information on the fields of mean monthly ocean surface temperature, surface pressure, 500-gPa geopotential surface and other parameters for a multiyear period. The basic principles for long-range prediction of OSTA as applicable to the GRAN method are outlined. A number of prognostic experiments were carried for testing the scheme. The purpose was an evaluation of the success of the prediction as a function of the makeup of the predictors. The various predictors used are discussed. It was found that the prognostic scheme gives the greatest gain in the case of quite large anomalies (in comparison with climatic and inertial predictions). The GRAN method also gives information which can be used in determining the processes involved in formation of temperature anomalies in the ocean. Predictions were prepared for 10 of the largest OSTA observed between 1957 and 1991. The results are given in a table. As a specific example, the results for one region for January 1983 also are given. The experiments clearly indicate that the group analogues scheme can be used successfully for long-range prediction of ocean water temperature and in some cases may be preferable to a categorical prediction. The method can be further improved by adjusting the predictors to the current process and varying them from prediction to prediction. Figures 2; references: 12 Russian.

New Generation of Equipment for Meteorological Lab Aircraft

947N0036B Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No. 3, Mar 94 (manuscript received 29 Nov 93) pp 103-109

[Article by A. V. Litinetskiy, V. V. Volkov, Yu. A Seregin, Central Aerological Observatory; UDC 551.509.617: 551.507.35]

[Abstract] This article describes the capabilities of the Tsiklon-1 and Tsiklon-2-S measurement and computing complexes for aircraft used for meteorological research and cloud seeding. The equipment is installed on An-26 and YaK-40 aircraft. The types of equipment included in both systems are described and specifications are listed. In general, the equipment may be divided into navigation instruments, measurement devices, and recording and imaging devices. The AgI dispensers used for cloud seeding are described. The Tsiklon-1 system features a Doppler velocity measurement device, an inertial navigation system, and Orbita-20 and Orbita-701 on-board computers. The Tsiklon-2-S system features a gyrocompass system. The systems take meterological readings to determine the feasibility of cloud seeding. Results of seeding may also be tracked. The systems include an aircraft position monitoring device. This makes it possible to coordinate actions in multi-aircraft cloud seeding operations. The Tsiklon-2-S system is more sophisticated in that it uses an IBM AT PC and a satellite navigational system (TRANSPAK). Information is stored on diskette. Schematics of both systems are provided. Figures 2; tables 3; references 12: 11 Russian, 1 Western.

Influence of Global Warming on Russian Agroclimatic Resources and Agricultural Productivity

947N0051B Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No. 4, Apr 94 (manuscript received 14 Dec 93) pp 101-112

[Article by O. D. Sirotenko and Ye. V. Abashina, All-Russian Scientific Research Institute for Hydrometeorological Information; UDC 551.583:631.559(47+57)]

[Abstract] The results of simulative modeling of the influence of global warming on Russian agroclimatic resources and agricultural production are generalized. Scenarios of both models of the theory of climate and paleoclimatic reconstructions were used in the computations. The totality of the collected data indicates that the development of warming in scenarios of models of general circulation of the atmosphere would lead to a substantial aridization of the climate of Russia in which it would be reasonable to expect a decrease in agricultural productivity, but the development of a warming under the scenario of an interglacial optimum would result in a universal moistening of climate and a substantial increase in agricultural productivity. The following scenarios of change in important climatic factors by the year 2030 (in comparison with 1990) are visualized: an increase in the

concentration of carbon dioxide by 20% (CO_2 x 1.2); an increase in the background concentration of tropospheric ozone by 30% (O_3 x 1.3); a decrease in the content of soil organic matter by 20% (HUM x 0.8). It is demonstrated that the direct influence of an increase in the carbon dioxide gas concentration would be capable of offsetting the agricultural losses associated with a climatic change under the most unfavorable scenario. However, the negative impact of an increase in the content of other greenhouse gases, especially tropospheric ozone, and anthropogenic degradation of soils would make this possibility problematical. It is emphasized that with any variant of global warming there will be a need for radical restructuring of the entire agricultural management system. The simulative modeling of this biospheric system, however, may reveal safe and economically feasible ways to bring about such adaptation. References 17: 9 Russian, 8 Western.

Combined Hydrological and Acoustic Study of the Polar Front in the Barents Sea With Contact and Remote Sensing Techniques

947N0038A Moscow OKEANOLOGIYA in Russian Vol. 34, No. 1, Jan-Feb 94 (manuscript received 27 Jun 93) pp 38-43

[Article by A. V. Berezutskiy, S. E. Maksimov, V. B. Rodionov, V. Ye. Sklyarov, Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow; UDC 551.46:629.78:551.463.262]

[Abstract] This article presents the results of comprehensive hydrological and acoustic studies of the structure of the Polar Front Zone in the central part of the Barents Sea during the third voyage of the Akademik Ioffe. Contact methods (CTD-photography, track measurements) and remote methods (IR radiometry, acoustic Doppler measurement of current speed, satellite sound backscattering studies) were used. The characteristics of fronts and associated phenomena (meanders and eddies) are studied. A significant correlation between hydrophysical and acoustic characteristics is detected. Surveying was done with 63 hydrological stations in a quasi-rectangular gird of nine meridional segments, each with seven stations 10 miles apart. The depth of the studied region was 200-350 m. Temperature and salinity gradients at the surface across the front reached 0.5 C/km and 0.15 0/00. Data on individual mesoscale meanders are presented. Eddy regions displayed the most significant curving of isolines. Maximum sound scattering values, 10-20 dB, were found at 100-200 m. At 50-90 m the contrast was 10-12 dB; below 200 m the contrast was no more than 4-6 dB. Analysis of echolocation measurements indicate the existence of mesoscale structures in the sound scattering field. Characteristic horizontal scales of regions with quasi-homogeneous scattering properties were 20-40 km, which matches the dimensions of dynamic formations. The transition regions between these zones have high gradients and the spatial configuration had the structural and dynamic features of a thermohaline field. Consequently, one can monitor mesoscale dynamic formations with echolocation equipment on a moving ship or on ocean bottom stations. Figures 5; references 13: 8 Russian, 5 Western.

Estimation of the Fractal Dimension of Global Relief

947N0038B Moscow OKEANOLOGIYA in Russian Vol. 34 No. 1, Jan-Feb 94 (manuscript received 14 Oct 92) pp 102-106

[Article by S. S. Ivanov, Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow; UDC 551.462]

[Abstract] This article examines the fractal relief of the Earth's surface on the global scale. Based on one-degree grid elevation values, lengths of various topographic isolines were computed for seven grades of averaging. The perimetric method is used to determine that at the 100-2000 km scale the relief isolines are actually fractal lines with dimensions which substantially exceed unity (1.30 and above). Several additional considerations make it possible to expand these limits to 5 and 20,000 km. The dimension of isolines depends on their hypsometric position. A simple model is proposed which illustrates the mechanism of this scale-dependent self-similarity of relief contours at different scales. Figures 6; references 9: 2 Russian, 7 Western.

New Data on Ferro-Manganese Nodule Growth Rate in the SE Pacific

947N0038C Moscow OKEANOLOGIYA in Russian Vol. 34 No. 1, Jan-Feb 94 (manuscript received 9 Jun 92) pp 113-120

[Article by I. E. Vlasova, V. M. Kuptsov, Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow; UDC 551.462]

[Abstract] The alpha track method is used to determine the growth rate of nine iron-manganese concretions obtained in the southeast Pacific Ocean, on either side of the East Pacific Ridge at the Bellingshausen Sea. The tracks were recorded on cellulose nitrate. The growth rate varies from 1-16 mm/million years. For three concretions the growth rates are determined for the two opposite sides: for two of them, the concretion did not increase in one direction, and in the third, the growth rate differs by a factor of two. The rate of accumulation of the sediments on which the concretions lie was determined through radiocarbon dating and with the excess ^{230}Th method. The rate varied slightly, with an average of 0.4 mm/million years. The divergence in the age of concretions and the sediments on which they lie is associated with the activity of benthic fauna, which explains the inversion of radiocarbon date with depth. Figures 5; tables 4; references 23: 16 Russian, 7 Western.

Scanning Towed Multi-Probe Chain

947N0038D Moscow OKEANOLOGIYA in Russian Vol. 34 No. 1, Jan-Feb 94 (manuscript received 9 Jul 92; after revision 30 Jun 93) pp 133-138

[Article by V. T. Paka, G. A. Bambizov, N. N. Golenko, Ye. P. Zarubin, V. A. Maslov, A. P. Podufalov, Atlantic Division of the Institute of Oceanology, Russian Academy of Sciences, Kaliningrad; UDC 551.465]

[Abstract] The towed probe chain examined here is a set of six CTD probes spaced 10-50 m apart in simultaneous

operation on a tow line. One is the Mark III profiler, produced by NBIS, USA. Katran 04M probes made by the Akvastandard Scientific Production Association in Sevastopol are used at other levels for economic reasons. To obtain fine structure profiles and high-resolution cross sections on the route, scanning is used with an amplitude which provides a certain overlap of levels at a boat speed of 3 m/s. Two scanning modes are available, one which minimizes overlap to increase horizontal resolution, and one which has a large overlap to increase the sounding depth. The Mark III probe is the fourth from the surface in the configuration displayed in the paper. The communication cable length may extend to 3 km without adverse effect. Illustrations show the configuration of the system and the trajectories of the probes in scanning mode. Data is recorded on a IBM PC/AT 386 clone. Profiles may be displayed in real time, but not printed (printing interferes with measurement). Examples of profiles obtained in Gulf Stream research are shown. The probes may be used together, separately, or in any combination. Figures 6; table 1; references 4: 2 Russian, 2 Western.

Turbulent Fluctuations of Photocurrent Strength of Coherent Lidar Systems

947N0042A Tomsk OPTIKA ATMOSFERY I OKEANA in Russian Vol. 6 No. 9, Sep 93 (manuscript received 28 Dec 92) pp 1091-1101

[Article by A. P. Shelekhov, Atmospheric Optics Institute, Siberian Department, Russian Academy of Sciences; UDC 537.87:621.371]

[Abstract] A study was made of the behavior of the relative variance of the turbulent fluctuations of photocurrent strength of CW and pulsed coherent lidars when using different schemes for the matching of wave fronts in optical heterodyning. It is shown that photocurrent strength fluctuations of a coherent lidar arise when there is a high spatial resolution of a single-mode heterodyne detector. The level of these fluctuations is proportional to the level of the turbulent fluctuations of the intensity of the sounding radiation. The proportionality factor is dependent on the angle of the detector field of view and it decreases with its increase. Applying these findings, the objective was the development of a coherent lidar with a high spatial resolution. This is possible only with single-mode detection. In comparison with methods for sounding the parameters of atmospheric turbulence based on measurement of intensity fluctuations of the scattered field, but using incoherent detection, a coherent lidar is more promising. Already with an entrance aperture of the receiving telescope R = 2.8 cm the spatial resolution of the lidar already is adequate for registering the intensity of random photocurrent modulation by about 50% on a path 1.06 km. A further increase in the sounding range is possible by increasing entrance aperture size. Without a considerable decrease in the signal-to-noise ratio this is possible to R = 7.5 for coherent lidar systems which are oriented on surface paths and up to R = 50 cm when sounding is from space. These and other results obtained in the study can be used in solving problems arising in practical use of coherent lidar systems. Figures 2; references 7: 4 Russian, 3 Western.

Large Bimorph Adaptive Mirror: Computation of Use Efficiency

947N0042B Tomsk OPTIKA ATMOSFERY I OKEANA in Russian Vol. 6 No. 9, Sep 93 (manuscript received 30 Mar 93) pp 1115-1123

[Article by A. V. Ikramov, I. M. Roshchupkin and A. G. Safronov, KOMPOZIT Scientific Production Association, Kaliningrad, Moscow Oblast; UDC 535.87]

[Abstract] The efficiency of use of a large bimorph adaptive mirror with compensation of large-scale low-frequency distortions is demonstrated. The theoretical approach to achieving efficient compensation of wave front distortions is outlined. Computer simulation of the correction of low-order optical aberrations with this mirror is described in detail. A comparative analysis is made of the efficiency of a large bimorph mirror and an adaptive mirror with discrete electromechanical drives. The results revealing a high efficiency of such a mirror in the compensation of large-scale low-frequency wave front distortions, were obtained for a controlling mosaiced piezoelectric layer 1 mm thick (with a thickness of the mirror plate 78 mm). This relation of thicknesses evidently is not optimal and was selected only to demonstrate the possibilities of a large bimorph adaptive mirror. It is proposed that a multilayer mosaiced piezoelectric structure be used for reducing the controlling voltage (which in the experiments was about 300 V). A similar approach also is applicable in selecting the optimum thickness of the piezoelectric structure. A simple and effective method is proposed for forming a mosaiced bimorph structure. It involves using a multilayer structure with the least possible thickness of the piezoelectric film and optimized total thickness. In this case the controlling voltage can be reduced to several tens of volts and the individual piezoelements need not be in contact with one another. Figures 4; references: 2 Russian.

Geological Factors in Global Changes: Importance of Catastrophes and Periodicity of Processes

947N0049A Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian Vol. 35 No. 3, Mar 94 (manuscript received 29 Nov 93) pp 3-19

[Article by N. L. Dobretsov, Joint Institute of Geology, Geophysics and Mineralogy, Siberian Department, Russian Academy of Sciences, Novosibirsk; UDC 551.14+ 536.25]

[Abstract] Findings from projects undertaken under the program Global Environmental and Climatic Changes and articles in leading international and Russian journals published during 1991-1992 are reviewed and two principal groups of problems are examined: geological factors in global changes in the environment and importance of catastrophes and periodicity of geological processes. The influence of endogenous processes caused by periodic mantle plumes on global changes is expressed through periodic bursts of catastrophic volcanism both in the oceans and in the island arcs, as well as periodic changes of movement of an ensemble of lithospheric plates and relief in the ocean and on the land, which in turn results in a change in the system of currents in the hydroatmosphere and climatic changes with periods of 30-34 million years. Shorter period changes are related to cosmic factors, especially Milankovitch cycles, although an interaction

between endogenous and cosmic factors is reflected at all levels. Short-term changes in currents and the entry of CO_2 may be stimulated by endogenous processes, and vice versa, changes in the Earth's magnetic field associated with endogenous factors may be superposed on solar activity changes. During periods of magnetic field reversal solar plasma may be "locked" in the Earth's magnetic field. All such theoretical concepts examined in this study require further development, particularly the theory of mantle plumes and their interaction with asthenospheric flows. Figures 10; references: 53: 13 Russian, 40 Western.

Landscape-Geochemical Analysis of the Landing Areas of Rocket First Stages

947N0037 Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 5—GEOGRAFIYA in Russian No. 1, Jan-Feb 94 (manuscript received 11 May 93) pp 40-48

[Article by N. S. Kasimov, A. P. Vorozheykin, T. V. Koroleva, Yu. V. Proskuryakov, V. B. Grebenyuk, Department of Landscape Geochemistry and Soil Geography; UDC 911.2:550.4(574.3)]

[Abstract] A new ecological issue is evaluation of the pollution caused by the landing of a rocket's first stage. The first stage contains fuel residue which contains a highly toxic compound, asymmetric dimethylhydrazine. Typically, the fuel explodes and burns on impact. In an explosion, the increase in temperature makes the substance more volatile; some fuel remains in the air, and is spread by the wind and precipitation. If there is no explosion, the fuel seeps into the ground. Oxidation products are harmful in either case. The physical and chemical properties of asymmetric dimethylhydrazine are examined. Research began in 1991 in Central Kazakhstan to study environmental anomalies caused by rocket fuel. Local high-contrast anomalies are due to direct contact, and more widespread low-contrast anomalies are associated with atmospheric transfer. Only 5% of soil samples revealed fuel residue concentrations above 0.02 mg/kg. The effects of various soil types, oxidation, and migration are examined. Concentrations of residue in vegetation were also studied. Content varied from 0.05-224.0 mg/kg, with the most common concentrations being 0.2-0.3 mg/kg. The maximum concentrations and largest percentage of contaminated samples were found at fall sites. Greater areas of vegetation than soil were contaminated, probably due to the combined effect of soil and atmospheric contamination. Root systems were studied to determine the method of contamination. It was found that plant type was also a factor. Seasonal differences in migration patterns, mainly due to temperature and evaporation, are explained. Figures 2; tables 2; references 11: 9 Russian, 2 Western.

Evaluating Tectonic Stability of Sites for Nuclear Power Plants (Exemplified by Site of South Ural Nuclear Power Plant)

947N0040A Moscow GEOEKOLOGIYA in Russian No. 1, Jan-Feb 94 pp 88-104

[Article by S. A. Nesmeyanov, O. A. Voyeykova, I. G. Mindel, D. I. Prokofyev and N. M. Khayme, Perm Scientific Research Institute for Engineering Seismology (PNIIIS); UDC 551.24+550.34 (471.503, 471, 505)]

[Abstract] At the PNIIIS experience has long been accumulated on carrying out many-sided (geological-geomorphological, geophysical and geodetic) research for detecting and predicting dangerous tectonic displacements at construction sites. Specifically, such materials were collected for the site of the South Ural nuclear power plant (NPP). The scope of this research program and the procedures used in the collection of pertinent materials are described in detail. The research program revealed that the Ural plant, which is under construction, is located in an area with favorable geological conditions and there are no contraindications with respect to recent tectonic movements against continuing construction because its site is situated within the limits of a unified morphostructural block. Moreover, the fault structures intersecting this construction site and the foundations beneath the reactors have not been rejuvenated during about the last 30 million years by local ruptures and zones of increased fracturing. The research program carried for this site is particularly important because it can serve as a model for other NPP sites where dangerous conditions may exist which should be detected before construction is initiated. It represents a considerable improvement over previous engineering programs used during study of NPP construction sites. Figures 6; references 24: 23 Russian, 1 Western.

Impact of Anthropogenic Changes in Global Climate on Runoff in Yenisey Basin

947N0044A in Russian No. 2, Feb 94 (manuscript received 20 Oct 93) pp 84-93

[Article by I. A. Shiklomanov, Arctic and Antarctic Scientific Research Institute; UDC 556.16"45":551.583 (282.256.3)]

[Abstract] Data are given on multiyear observations of changes in hydrometeorological characteristics in the Yenisey basin resulting from the global warming of climate in the 1980's. Estimates are given of the possible changes which may occur with an increase in global temperature by 1-2 and 3-4°C. Predictions made at the State Hydrological Institute on the basis of paleoclimatic reconstructions of warm epochs of the past are used as climatic scenarios of the future. A model with a monthly computation time interval was used for conversion from the climatic parameters to hydrological characteristics. The increase in temperature and precipitation in the Yenisey basin which began in 1975 indirectly confirms the conclusion that there has been a global warming of climate. At the present time the rate of increase in temperature and precipitation in this region exceeds the computed values for the Earth. However, the increase in the mean annual precipitation has not resulted in a change in annual and seasonal runoff. Under all scenarios of change in the climatic situation runoff in the Yenisey basin will substantially increase. With a climatic warming there will be a seasonal redistribution of runoff and the duration of winter will substantially decrease. The study was made without allowance for the influence of permafrost on the hydrological regime of rivers in the Yenisey basin under conditions of a climatic warming, which would be especially significant with a temperature increase > 2-3°C. Figures 4; references 9, 7 Russian, 2 Western.

Aspects of Engineering Geology Study of Salt Formations for Constructing Underground Repositories for Harmful Industrial Wastes

947N0041A Moscow GEOEKOLOGIYA in Russian No. 2, Mar-Apr 94 (manuscript received 12 Sep 93) pp 37-47

[Article by V. I. Osipov, B. K. Lapochkin and O. N. Yeremina, UDC 624.131]

[Abstract] The need for and desirability of constructing deep underground repositories in rock salt formations for the storage of solid and cast-off toxic and radioactive industrial wastes is demonstrated. Foreign experience along these lines is discussed. The principal requirements on rock salt formations, regarded as potential sites for constructing cavernous repositories, are examined and the technological procedures for preparing such repositories are outlined. Different variants are evaluated, but in every case the excavation results in recovery of great volumes of valuable mineral raw material useful in the production of various kinds of soda, paper, artificial rubber and other products. The need for developing a special engineering geology classification of salt formations is validated. A table lists the principal regions in Russia which could be considered for constructing such salt formation repositories. The selection criteria show that it would be most effective to use salt formations of the stratum type, as well as those characterized by a relatively simple internal structure. In this selection process it is particularly necessary to ascertain the spatial position of intercalations of insoluble rocks and also easily soluble (potassic, magnesian salts) formations. Additional factors must be taken into account when considering complex structures of the salt dome type. References 10: 5 Russian, 5 Western.

BIOTECHNOLOGY

Conversion of Glycyrrhizic Acid. Part 5. Synthesis of Homoderivatives of Penta-O-Acetyl Glycyrrhizic Acid

947C0267A Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol. 63 No. 9, Sep 93 (manuscript received 18 Dec 92) pp 2131-2139

[Article by L.A. Baltina, N.T. Serdyuk and G.A. Tolstikov, Institute of Organic Chemistry, Ural Branch, Russian Academy of Sciences, Ufa; UDC 547.919.2+543.422.25]

[Abstract] Details are presented on the conversion of penta-O-acetyl glycyrrhizic acid to higher homologs using the Arndt-Eistert synthesis. The conversion scheme included introduction of diazoketone group at the carboxyl groups of the aglycone and carbohydrate moieties of the molecule to grow hydrocarbon side chanins. The resultant products bore Cl, Br, ketone, acetoxyketol, ketoimine and (2-acetylamino)thiazole moieties, as confirmed by ^{13}C NMR studies. Yield ranged from about 61 to 90%. Tables 1; references 14: 8 Russian, 6 Western.

Protected Glycopeptides

947C0267B Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol. 63 No. 9, Sep 93 (manuscript received 18 Dec 92) pp 2140-2147

[Article by L.A. Baltina, S.A.Ryzhova, Ye.V. Vasilyeva, A.P. Kapina and G.A. Tolstikov, Institute of Organic Chemistry, Ural Branch, Russian Academy of Sciences, Ufa; UDC 547.919.2+582.736]

[Abstract] Technical details are presented on the synthesis of a series of glycopeptides derivatives of glycyrrhizic acid as part of a screening program for potential immunomodulating agents. The basic approach consisted of activation of the carboxyl group with N-hydroxybenzotriazole and N,N'-dicyclohexylcarbodiimide—1:3-4:3-4 molar ratio—in dioxane or THF. The activated intermediates were reacted with amino acid esters prepared in situ from the hydrochlorides in the presence of a tertiary base (eg., pyridine, triethylamine)—3.5-4:4-5—for 24 h at 0-5°C. The target products were obtained in pure yields of 79-95%. Tables 3; references 8: 6 Russian, 2 Western.

Human Recombinant Insulin. Part 2. Size-Exclusion HPLC of Precursors: Retention and Selectivity

947C0231A Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol. 29 no. 2, Feb 93 (manuscript received 17 Jul 92; in final form 29 Sep 92) pp 174-181

[Article by V.Ye. Klyushnichenko, A.N. Vulfson, Institute of Bioorganic Chemistry imeni M.M. Shemyakin and Yu.A. Ovchinnikov, Russian Academy of Sciences, Moscow; UDC 577.112.088.3:543.544]

[Abstract] An analysis was conducted on the factors affecting retention and exclusion of precursors of recombinant human insulin on size-exclusion HPLC. The study involved chromatography of 6-17 kD insulin precursor peptides on TSK G 300 SW columns, using 0.1 M sodium phosphate elution buffers, pH 7.0, with and without 0.2 M NaCl or 0.2 M sodium sulfate. The resultant data demonstrated that K_d increased with an increasing ionic strength, with the most stable separations evident at an ionic strength range of 0.1 to 0.4. Addition of low concentrations (0.01-0.05%) of 0.1 M SDS led to a sharp reduction in K_d, with higher concentrations (0.05-0.2%) having little further effect. Efficient separation was also obtained with 6 M guanidine hydrochloride because of the greater differences between points corresponding to the different K_d values of the proteins—including poorly soluble linear and folded proinsulin. Accordingly, size-exclusion HPLC was shown to lend itself to analytical determinations at all stages of recombinant insulin production. Figures 7; references 36: 4 Russian, 32 Western.

Diastereoisomers of Anionic Oligonucleotide Analogs. Part 7. Determination of Absolute Configuration at Phosphorus Atom of Diastereoisomers of Deoxydinucleoside Methyl Phosphonates by 2D NMR ROESY Spectroscopy

947C0231B Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol. 29 no. 2, Feb 93 (manuscript received 22 Nov 91) pp 197-210

[Article by Ye.V. Vyazovkina, I.V. Engels* and A.V. Lebedev, Novosibirsk Institute of Bioorganic Chemistry, Siberian Branch, Russian Academy of Sciences; *Institute of Organic Chemistry, J.W. Goethe University, Frankfurt-am-Main; UDC 577.113.6.088.53:543.422.25]

[Abstract] Two-dimensional NMR ROESY spectroscopy was employed in assessing the configuration about the P atom of 16 pairs of deoxydinucleoside methyl phosphonates with the general formula $[MeO)_2Tr]Np-(CH_3)N'(Ac)$ and the unnatural -O-P(CH_3)(O)-O- internucleoside bond. In the formula, N- and N' indicate the base protected dinucleosides. Cross-relaxation data on interaction of P-CH_3 protons with the 3'-end nucleoside revealed differences only in the case of H(3')- and H(4')-protons of pyrimidine nucleosides. These interactions were more pronounced in the case of the S_p isomers. Accordingly, the spectral variations between the diasteroisomers were due to conformational differences predicated on the nature of the heterocyclic bases in the dimers. Figures 3; tables 3; references 17: 2 Russian, 15 Western.

Two Approaches to Large-Scale Synthesis of Oligonucleotide Dithioates

947C0231C Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol. 29 no. 2, Feb 93 (manuscript received 28 Aug 91; in final form 16 Jun 92) pp 211-222

[Article by M.O. Takakishvili and M. H. Caruthers*, Chemical Faculty, Tbilisi State University imeni I. Dzhavakhishvili, Tbilisi; Department of Chemistry, University of Colorado, Boulder, USA; UDC 547.857.7'455.057:577.113.6]

[Abstract] Technical details are presented on liquid- and solid-phase syntheses of oligonucleotide dithioates as potential antivirals and antineoplastics. Liquid-phase triester approach yielded dimers and tetramers in millimolar

quantities and octamers at the 0.1 mmolar level. Solid-phase approach on polyethelene glycol support with thioamidite reagent provided the octanucleotide dithioates ($T_8(S_2)$ and $C_7T(S_2)$ in yields of 0.02 and 0.12 millimoles, respectively. The products of solid-phase synthesis were purified by a novel method including cleavage of the protected oligonucleotides from the polymeric carrier, adsorption chromatography on silica gel, complete removal of protective groups and, finally, reverse-phase chromatography on silica gel C_{18}. Figures 3; references 76 (Western).

New Data on Radionuclide Pollution of Barents Sea Region

947C0250A Moscow DOKLADY AKADEMII NAUK in Russian Vol. 332 No. 1, Sep 93 (manuscript received 17 May 93) pp 118-119

[Article by D.G. Matishov, corresp. member, Russ. Acad. Sci., G.G. Matishov, Ye. Shchipa and L.G. Pavlov, Murmansk Marine Biology Institute, Kola Scientific Center, Russian Academy of Sciences; UDC 574.4:504.05(268.45)]

[Abstract] Radionuclide monitoring studies conducted in 1991 and 1992 on Barents Sea and adjacent shoreline showed that Cs-137 levels ranged from essentially zero to 1440 Bq/kg of benthic sample collected from different locations. Measurements on mossess and lichens from adjacent shores revealed levels of contamination with Cs-137 approaching 530 Bq/g at some locations. These findings indicate that the Barents Sea region has sustained an increase in the level of radionuclide contamination over the past four decades. The contaminating radionuclides derived from nuclear weapons testing in the fifties and sixties, activities of Western radiochemical plants, as well as the the Chernobyl accident. References 6: 2 Russian, 4 Western.

Concept of Basic Genome and Critical Chromosome Mass in Eukaryotes

947C0250B Moscow DOKLADY AKADEMII NAUK in Russian Vol. 332 No. 1, Sep 93 (manuscript received 2 Apr 93) pp 126-128

[Article by A.P. Akifyev, Institute of Chemical Physics imeni N.N. Semenov, Russian Academy of Sciences, Moscow; UDC 575.8]

[Abstract] Only ~10% of the DNA in the human genome represents structural genes, regulatory sequences, origins of replication, sequences bound to the nuclear matrix and P-repeats. A theory is proposed that this DNA be regarded as basic genome of the eukaryotic cells. The reason for the excess DNA present in the eukaryotic genome remains enigmatic, but one answer may be that it provides a critical chromatin mass necessary to maintain the structural organization and macromolecular framework for successful mitosis or meiosis. Studies on the human genome could be considerable facilitated and reduced in cost if such efforts were to be solely directed at the basic genome, excluding the non-basic genome from the sequencing efforts. References 14: 4 Russian, 10 Western.

New Plasmidovars of *Y. pestis* Strains Isolated in Mongolia

947C0203 Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No.11, Nov 91 (manuscript received 18 Jun 91) pp 27-29

[Article by S. V. Balakhonov, S. Tsendzhav, A. Erdenebat; UDC 579.842.23:579.252.5].083.12(517.3)]

[Abstract] Determining the plasmid spectra of plague pathogen strains is an important means of increasing the effectiveness of epidemiological control systems for plague. The plasmid spectra of 122 strains of *Yersinia pestis* were isolated in Mongolia from patients, wild mammals, and arthropods. The populations of three plasmidovars of *Y. pestis* were circulating in the natural foci of plague in Mongolia. Samples were tested for Ca^{2+} growth dependence at 37°C. Of the three plasmidovars, the first harbors three plasmids with mol masses 6, 47, 65 Md. The second and third contain plasmids with mol masses 6, 16, 47, 65 Md and 8, 47, and 75-80 Md. It is hoped that this work will help solve the problem of intraspecific differentiation of the plague microbe and will uncover the mechanism for the formation of epidemically significant populations of *Y. pestis* and determine their clonal structuring. Figures 2; references 13: 7 Russian, 6 Western.

Immunomorphological Characteristics of New Monoclonal Antibodies ICO-84 and ICO-103

947C0228 Moscow VESTNIK ONKOLOGICHESKOGO NAUCHNOGO TSENTRA AMN ROSSII in Russian No. 2, Apr-Jun 93 (manuscript received 11 Feb 92) pp 8-12

[Article by O. A. Sedelnikova, N. N. Petrovichev, A. Yu Baryshnikov, Scientific Research Institute of Clinical Oncology; UDC 618.19-008.839.624-078.33]

[Abstract] The ICO-84 and ICO-103 monoclonal antibodies (Mab) (developed at the Laboratory of Clinical Radioimmunology of the ONTs [expansion not given] of the Russian Academy of Medical Sciences) were studied to determine their reactivity spectrum with tumors of various histogenesis, to compare results of histological and cytological studies, and to evaluate the possibility of using these antibodies in oncocytology to label malignant cells. Epithelial and nonepithelial tumors were used to study Mab reactivity. Detailed information on tissue types and reactivity is given in the table. Sample handling is described in detail. Mab ICO-84 exhibited a broad spectrum of interaction with human malignant neoplasm cells. The strongest reactions were noted for colorectal carcinoma, lung, breast, stomach and esophageal cancers. Mab ICO-103 also reacted to a wide range of epithelial tumors. Most intense reactions were noted for breast, uterine, and thyroid tumors. Less frequent but equally intense reactions were found for ovarian, lung, and kidney tumors. Reaction types are categorized. Immunochemical reactivity in cytological specimens agrees well with findings for histological sections. Mabs ICO-103 and ICO-84 may be used to mark epithelial tumors and to determine the epithelial nature of malignant cells. They may also be used with other antibodies for differential diagnosis of metastatic poorly

differentiated tumors and lymphoproliferative diseases. Figures 4, table 1; references 8: 5 Russian, 3 Western.

Simulation of Biopolymer Molecular Structure

947C0229B Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol. 26, No. 6, Nov-Dec 1993 pp 1209-1241

[Article by M. V. Volkenshtein, I. B. Golovanov, I. G. Lysogorskaya; Institute of Theoretical and Experimental Biophysics of the Russian Academy of Sciences, Pushchino; UDC 577.112.6]

[Abstract] A relatively simple "vacuum approximation" method of conformational analysis and a method for estimating the free energy of molecular transfer from the gaseous (organic) to the aqueous phase were described and proposed as alternatives to the traditional approach to simulating biopolymer molecular structure. The rational for the simplified approach was based on two equations derived from the thermodynamic cycles employed to quantitatively express molecular structures and processes. These equations can be used to estimate the free energies of these processes in water. The simplified approach was used to simulate the structure of molecules and molecular associations in the aqueous phase, to simulate simple molecular systems and quantify their hydrophobic interaction, and to simulate the structure of hydrocarbon polymers and glycine and alanine oligopeptides in the organic and aqueous phases. It was found that a polymer molecule bends back under itself in water, forming a compact structure and reducing the total molecular surface, leaving the accessible surfaces of the polar groups located in the linear sections unchanged while increasing the accessible surfaces of the groups located where the molecule bends. This gives the molecule an advantage by maximizing hydrophobic interaction and by maximizing the hydration of the polar groups. Such behavior is typical for any polymer, thus optimizing their ability to interact with surrounding water molecules. This pattern is also valid for peptides and proteins. The behavior of the glycine and alanine peptides was found to be similar to one another in many ways, with one notable exception involving a substantially lower free energy contribution for the β_L and α conformers in the alanine, and consistent with existing experimental data. Figures 11, tables 22; references 65: 14 Russian, 51 Western.

Slipped-Loop Structure—A New Type of Polynucleotide Chain Folding

947C0229C Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol. 26, No. 6, Nov-Dec 1993 pp 1263-1273

[Article by M. Z. Gorgoshidze, E. Ye. Minyat, A. A. Gorin, [illegible] Demchuk, V. A. Farutin, V. I. Ivanov; Institute of Molecular Biology imeni V. A. Engelgardt of the Russian Academy of Sciences, Moscow; UDC 577.323]

[Abstract] Specially synthesized oligonucleotides were used to detect and study SLS polynucleotide chain folding, the [illegible] model of which was constructed to explain the [illegible] sensitivity of short tandem base repetition [illegible] hypothetical stress to single-strand specific nuclease. A 19-unit oligonucleotide capable of forming a pseudogene was chemically modified under conditions that preserved the secondary structure in order to clarify the state of the timines and adenines. The modification sites were then split in hot piperidine. To confirm the physical existence of SLS, a special 55-unit oligonucleotide was designed and synthesized. The results of chemical modification at the single nucleotide resolution level together with localization of the cleavage sites with S1 nuclease revealed that one and the same base pairs exhibited markedly different levels of sensitivity to the modifier depending on their sequence location, and that those base pairs that were strongly modified were already known to be in a single-strand state or at the end of the helix. Those found in the helical backbone or in the hypothesized interloop mini-helix, were weakly modified, if at all. These data strongly support the model of a highly symmetrical slipped-loop structure with a stabilized interloop helix. To be even more sure, the cleavage representation of the same oligonucleotide with the S1 nuclease was studied. Three compact regions of intensive cleavage were clearly visible: the nucleotides of the end loop and the unpaired nucleotides of both of the loops forming the mini-helix. A GenBank search of nucleotide sequences turned up a low estimate of 518 sites capable of SLS generation. Figures 10; references 15: 2 Russian, 13 Western.

DNA Sequencing by Hybridization With Oligonucleotide Matrix (SHOM). Theory of DNA Washing Out After Hybridization

947C0229D Moscow MOLEKULYARNAYA BIOLOGIYA in Russian Vol. 26, No. 6, Nov-Dec 1993 pp 1298-1313

[Article by M. A. Livshits, I. B. Ivanov, A. D. Mirzabekov, V. L. Florentyev; Institute of Molecular Biology imeni V. A. Engelgardt of the Russian Academy of Sciences, Moscow; UDC 577.323]

[Abstract] The practical difficulties inherent in using hybridization with an oligonucleotide matrix (SHOM), a new DNA sequencing method developed by the authors three years ago, have been overcome by a procedure that obviates the problems associated with the different stabilities of the AT- and GC-rich hybrids. First, a 10-30-μm layer of 8% cross-linked polyacrylamide gel is applied to a glass plate. The oligonucleotide is then immobilized throughout the entire cell, which is a 50 to 1000-μm gel square halved by a large divider of hydrophobized glass. By making the capacity of the carrier very large, the oligonucleotide concentration amounts to 1 to 90 μm. Finally, the quantity of DNA fragment is selected so that 1/100 of the binding sites are occupied during complete hybridization. It was found that the effect of varying any parameter on the "washing-out" temperature, Tw, depended on the enthalpy of the process. An overall increase in the stability of all the oligonucleotide matrix duplexes inevitably "narrowed" the Tw range, which could compromise the sensitivity of the method. Tw was insignificantly affected by ΔT between 5 and 20°C. An increase in washing-out time results in a higher Tw. Tw also depends on oligonucleotide concentration; generally, the concentration of oligonucleotides that form less stable

duplexes should be increased to a greater degree than those forming less stable duplexes. Finally, lengthening the DNA fragment results in a slight increase in Tw. This knowledge makes it possible to calculate Tw with sufficient accuracy. This study was commissioned by the Russian National HUMAN GENOME Program. Figures 2, tables 4, references 9: 2 Russian, 7 Western.

EPIDEMIOLOGY, MICROBIOLOGY, AND VIROLOGY

New Ultrapure Vaccines From Russian Medical Academy

[MEDITSINA SEGODNYA, No. 4,1994, etc.]

[Editorial Report] The Medical Academy imeni Sechenova claims to have developed a method for obtaining vaccines that significantly exceed the international standard for purity. The Moscow physicians' newspaper MEDITSINA SEGODNYA (No. 4 1994) reports that the new purification method will enable Russia to meet its domestic demand for vaccines and also to sell vaccines abroad.

The method uses novel filters developed by the medical biotechnology laboratory of the Sechenova Academy in collaboration with the Khimvolokno Scientific Production Association. The new filters consist of hollow synthetic fibers used in spacecraft filters, which remove impurities in several stages until the preparation is molecularly uniform. According to the newspaper, the purity of vaccines made with the filters is 1900 to 2500 antigen units, higher than the World Health Organization standard of 1500 antigen units. Purification equipment using the filters can process 40 liters of concentrated preparation in three hours, as compared to 1 liter per hour using conventional membrane disk filters. The Bioavtomatika Scientific Research Center in Nizhegorod makes the purification equipment.

MEDITSINA SEGODNYA reported that the Sechenova Academy has already used the new technology to create an extremely pure diphtheria anatoxin, soon to be mass produced by Biomed in Moscow. In collaboration with the Moscow Chemical Technology Institute imeni M. V. Lomonosov, Sechenova has also developed a better test for evaluating immunity to diphtheria. The test kit uses colored latex coated with purified anatoxin as an immunity indicator. It has a two-year storage life when refrigerated, compared to two to three months for erythrocyte-based tests. The test can be used for rapid assessment of individual or group immunity to determine if vaccination is necessary and safe (Moscow MEDITSINA SEGODNYA No. 4 94).

Viturid: Bringing It All Back Home

[NEZAVISIMAYA GAZETA, 6 Jan 94, etc.]

[Editorial report] Viturid, a powerful new immunostimulant claimed to be effective against both AIDS and cancer, has won the support of Russian Federation Health Minister Eduard Nechayev. Despite sponsorship offered by the U.S. government and a San Francisco hospital, the developer, Tamara Vorobyeva, has turned to the Russian Federation government for assistance in testing and perfecting the pharmaceutical, claimed to be worth "billions of dollars." A NEZAVISIMAYA GAZETA (6 Jan 94) article details Vorobyeva's resourcefulness and persistence in pursuing development of the drug despite her country's political and economic turmoil.

Said to be ten times more effective than standard U.S. and Soviet therapies, Viturid reportedly guarantees a complete cure for second-stage and even some third-stage cancers. Patients with fourth-stage osteogenic sarcoma and sarcoma of the lungs were among those reported cured (Moscow NOVOYE VREMYA No 4 Feb 94). In clinical tests, tumors treated with Viturid became benign and then completely regressed. Viturid is also claimed to be effective against the human immunodeficiency virus before immunodeficiency occurs (Moscow NEZAVISIMAYA GAZETA 6 Jan 94). It is also claimed to be "extremely effective" against a wide range of diseases, including psoriasis, ulcers, herpes, arthritis and salmonellosis (Moscow NOVOYE VREMYA No. 4 Feb 94). Press reports do not give the pharmaceutical's composition, but note that it possesses very low toxicity. Ninety percent of its toxic elements are excreted within 6 hours of administration.

An analytical chemist, Vorobyeva based Viturid on an old therapeutic recipe which she used to cure herself of stage III cancer. In February 1985 she applied for a patent for "a treatment for cancer and AIDS." In July 1989 she received the state patent commission's certification that her invention was scientifically valid. In June 1990, Chairman Lepakhin of the All-Union Pharmaceutical Committee requested 50,000 rubles from Academy of Medical Sciences President Pokrovskiy to begin clinical testing of Viturid in Moscow. But deteriorating economic conditions then stalled progress for a year.

Thanks to the personal intervention of Ukrainian Health Minister Boris Spizhenko, clinical trials began in March 1991 at the Kiev Scientific Research Institute of Pharmacology and Toxicology. Successful results were announced in April 1991. A ROSSIYSKAYA GAZETA article (25 Feb 92) reporting these results enthusiastically called on the Russian and Ukrainian Health Ministers to authorize production of the drug. To permit Vorobyeva to earn capital for further research, the Ukrainian Health Ministry approved Viturid for therapeutic use in less than the normal time.

The collapse of the Soviet Union forced Vorobyeva to return to Russia, where her patent claim had been filed, to try again to solicit support from the government. On 18 February 1992, Russian Vice Premier Aleksandr Shokhin told the Health Ministry and the Academy of Medical Sciences to examine and support Vorobyeva's proposal for further research. The Academy promised help from the Moscow Scientific Research Institute for Oncology imeni Gertsen, on the condition that the inventor find the necessary capital, said to be millions of rubles.

In September 1992, Vorobyeva applied for a U.S. patent. According to press reports, the U.S. government quickly

"took her patent applications under its wing" and granted her a three year work permit. A San Francisco hospital offered to conduct clinical tests in exchange for the right to use the pharmaceutical. Vorobyeva found this condition unacceptable and formed her own company in the United States, while continuing to solicit aid in Russia.

This time Vorobyeva may have found the support she needs. In 27 July 1993, she received four Russian patents for her pharmaceutical and for her treatment method. A fifth patent registering Viturid as an immunomodulator followed on 8 December 1993 (Moscow NOVOYE VREMYA No. 4 Feb 94). Russian Health Minister Eduard Nechayev tasked his subordinates to confirm preliminary tests on Viturid by January 1994. Unable to support the inventor financially, Nechayev wants to commence use of Viturid for some diseases in order to finance full testing of all its possible uses. Clinical tests of Viturid by the Karelian Ministry of Health started in October 1992. The Russian Health Ministry is reportedly now preparing for industrial production of the new pharmaceutical (Moscow NOVOYE VREMYA No. 4 Feb 94).

Producing and Describing Monoclonal Antibodies to Recombinant Proteins of HIV-1 and HIV-2 env and gag Gene Products

947C0202A Moscow VOPROSY VIRUSOLOGII in Russian No.6, Nov-Dec 93 [manuscript submitted 6 Apr 93] pp 253-255

[Article by A. V. Pugach, V. V. Zverev, E. R. Pille, N. R. Shukhmina, N. L. Melnikova, D. N. Nosik, V. V. Malyushova, O. G. Andzhaparidze, Scientific Research Institute of Viral Preparations, Russian Academy of Medical Sciences; Institute of Virology imeni D. I. Ivanovskiy, Russian Academy of Medical Sciences, Moscow; UDC 616.98:578.828.6/-078.33]

[Abstract] Current screening for HIV infection looks for viral protein antibodies in the blood. Primary antigenemia, however, is known to precede seroconversion, a fact that makes the creation of test systems for determining HIV antigens desirable as a possible early diagnostic tool. Since monoclonal antibodies to viral proteins have high specificity and homogenicity, they are ideally suited just such test systems. The researchers here produced a total of 152 hybridomas whose monoclonal antibodies react in EIA with β-galactosidase-grafted recombinant proteins that are products of HIV-1 and HIV-2 gag and env genes. The list of hybridomas was narrowed down to 10 whose antibodies interact with a recombinant HIV antigen only. Three clones—24/13, 24/16, and 24/26—produced antibodies to the HIV-1 gag gene and reacted with natural viral proteins. The antibodies of 24/16 and 24/46 interacted with p24 only, whereas 24/13 interacted with p55 and seven polypeptides that were not fully processed products of the HIV-1 gag gene. In EIA, 24/46 interacted with both the HIV-1 antigen and the HIV-2 antigen. The three clones bear different protein-binding sites. Two clones—41/23 and 41/128—produced antibodies to the protein product of the HIV-1 env gene. Five hybridomas—38/3, 38/8, 38/12, 38/15, and 38/17—produced antibodies to the HIV-2 env gene. Figures 2, references 11 (Western).

Risk Factors for the Transmission of HIV Infection Among Intravenous Users in Russia

947C0202B Moscow VOPROSY VIRUSOLOGII in Russian No.6, Nov-Dec 93 [manuscript submitted 22 Apr 93] pp 258-261

[Article by I. G. Savchenko, V. V. Pokrovskiy, et al.; UDC 616.98:578.828.6]-002.369:616.89-008.441.13]-07]

[Abstract] Intravenous drug users represent a potential reservoir for HIV. The researchers here performed a computer study of monthly reports from AIDS-prevention centers, daily reports of HIV infection, and reports of epidemiological investigations filed in the Russian Center for Controlling AIDS to identify a correlation between HIV infection and drug use. They found that, as of 1 November 1992, a total of 588 individuals had been diagnosed as having HIV, and eight of those individuals had had casual sex with drug users. A poll of 86 intravenous drug users indicated that most of them (upwards of 90 percent) shared unsterilized needles. None of those polled had shared needles with foreigners, although 13-18 percent had shared needles with prostitutes. Users of so-called pervitin accounted for the highest percentage of drug users who had sex immediately after intravenous injection of the drug. Most of those polled did not have a steady sex partner, did not use condoms, and had sex with prostitutes. Only 6 percent had had sex with foreigners. The pervitin users appear to be at greatest risk among the drug users for spread of HIV. References 6 (Western).

Experience in the Production of Inactivated Lassa Fever Vaccine

947C0202C Moscow VOPROSY VIRUSOLOGII in Russian No.6, Nov-Dec 93 [manuscript submitted 25 Feb 93] pp 276-279

[Article by V. P. Krasnyanskiy, N. V. Potryvayeva, I. V. Borisevich, V. N. Gradobovev, T. P. Pashanina, V. A. Pshenichnov [deceased], Virology Center, Scientific Research Institute of Microbiology, Russian Federation Ministry of Defense, Sergiyev Posad; UDC 615.371:578.832.26.012]

[Abstract] It has been shown that Macaca rhesus monkeys injected with the Mozambique virus, which is closely related to the Lassa virus in terms of antigens, are protected against subsequent infection with a virulent strain of the Lassa virus. Owing to the fact that Mozambique virus is not pathogenic to man or monkeys, some researchers feel that Mozambique virus is a candidate for use in the preparation of a live vaccine designed to prevent Lassa fever. Before that can be done, however, convincing evidence must be produced to the effect that the virus is definitely not pathogenic to man, and it must be certain that the virus would not persist in the human body. Data published in the late 1980s reported testing of a recombinant Lassa vaccine on guinea pigs and monkeys, all of whom survived a lethal dose of Lassa virus after being vaccinated with the recombinant vaccine. Protection was not total, however, as they developed short-term fever and virusemia. That prompted the researchers here to study an inactivated vaccine against Lassa fever. The vaccine [illegible]

tested protected Papio hamadryas monkeys against intramuscular infection of Lassa virus after both two immunizations and one immunization in doses of 1.1-2.1 mg and 0.5-1.1 mg. The percentage of those protected dropped to 50 percent when infection was via the aerogenic route and immunization was performed only once, in a dose of 1.1 mg. The protective effect was observed against the backdrop of an absence of specific virus-neutralizing antibodies. References 13: 4 Russian, 9 Western.

Accelerated Solid-Phase Enzyme Immunoassay in the Diagnosis of Viral Infections

947C0202D Moscow VOPROSY VIRUSOLOGII in Russian No 6, Nov-Dec 93 [manuscript submitted 12 Aug 92] pp 284-285

[Article by V. A. Mishchenko, M. G. Kostyuchenko, M. A. Bazarov, T. B. Konyushkina, A. B. Smirnov, O. S. Puzankova, Scientific Research Institute of Foot and Mouth Disease, Vladimir; UDC 616.98-078.33]

[Abstract] Enzyme immunoassay is the preferred test for diagnosing viral and bacterial infections among animals for a number of reasons, among them its simplicity and quickness of execution, its high level of sensitivity, the accessibility and stability of the reagents used. The researchers here developed a field technique that will analyze a serum sample for the presence of antigens or their antibodies and provide on-site results. Test results are produced within 30-40 minutes (as opposed to the best current time of 3-4 hours), without the need for complex instrumentation. References 11 (Russian).

MEDICINE AND PUBLIC HEALTH

Russia Establishes Diphtheria Control Program

[RABOCHAYA TRIBUNA, 16 Apr 94 p 2]

[Editorial Report] During 1993, Russia experienced an unusually high incidence of diphtheria. In the first nine months of 1993, the republic experienced 7628 cases and 300 deaths, a 3.5-fold increase over the previous year (Moscow NEZAVISIMAYA GAZETA 4 Dec 93). By year's end authorities had recorded 15,229 cases, 4503 of them among children, and 468 deaths. The first two months of 1994 saw 4000 new cases and 100 deaths (Moscow RABOCHAYA TRIBUNA 16 Apr 94). Experts consider the main cause of the epidemic to be a low vaccination rate, resulting from public concerns about vaccine safety (Moscow TRUD 1 Jul 93, Moscow NEZAVISIMAYA GAZETA 4 Dec 93).

In October 1993, the Russian Federation government created a special diphtheria control center, headed by A. Tsaregorodtsev (Moscow NEZAVISIMAYA GAZETA 4 Dec 93, Moscow MEDITSINA SEGODNYA No. 21-22 1993, Moscow RABOCHAYA TRIBUNA 16 Apr 94) and passed a decree requiring vaccination of 75 percent of the entire population by 1995 (Moscow MEDITSINA SEGODNYA No. 21-22 93, Moscow Ostankino Television First Channel and Orbita Networks 3 Feb 94). Neither the country's stocks of diphtheria vaccine nor its production capabilities were adequate to support the immunization program (Moscow MEDITSINA SEGODNYA No. 21-22 1993). Consequently, at the Center's prompting, the government allocated funds to purchase foreign vaccines and develop domestic production (Moscow NEZAVISIMAYA GAZETA 9 Nov 93, Moscow MEDITSINA SEGODNYA No. 21-22 93, Moscow RABOCHAYA TRIBUNA 16 Apr 94).

Measures Proposed to Encourage Childbearing

[VRACH, Sep 93]

[Editorial report] Russian media have reported various initiatives to overcome what has been characterized as a continuing demographic crisis. In an article published in the Ministry of Health periodical VRACH [Physician], Candidate of Medical Sciences V. Brutman, who is a member of the administration of Independent Association of Pediatric Psychiatrists and Psychologists, reported that a group of physicians, psychologists, legal scholars and sociologists has proposed a program for women deemed likely to obtain abortions or to reject their newborns (Sep 93). A key element of the draft program "Prevention of Early Rejection of Motherhood" is a crisis center, which would identify and counsel pregnant women at risk of rejecting their infants. The crisis center would maintain a hot line and a crisis team, which would visit maternity hospitals to intervene in cases where rejection seems imminent. Women with high-risk social indicators would be hospitalized at maternity homes to receive "intensive assistance in continuing their pregnancies." After providing therapy to restore normal parent-child relations, a live-in "rehabilitation center" would keep its graduates under observation for several years. The measures are intended to support women without [illegible]

More recently, a different approach to demographic problems was suggested by biologist Evgeniy Tsvetov in an article on the first page of ROSSIYSKIYE VESTI (26 Feb 1994). Tsvetov, who blames the country's demographic decline on its acute environmental problems, excessive consumption of inferior quality alcohol and [illegible] opposes the manufacture of contraceptives in Russia.

Wolves at the Door: Malnutrition Follows Food Prices on Upward Spiral

[TRUD, 3 Feb 94]

[Editorial Report] Admitting that starvation was a "real threat" in Moscow last winter, the Russian Federation government recently loaned Moscow 550 billion rubles to purchase food (Moscow INTERFAX 8 Feb 94). Moscow was not the only city to suffer from inadequate nutrition, which has become a problem throughout the Russian republic.

High prices and low wages have made nutritional deficiency commonplace throughout Russia. In September 1993, families spent 60 percent of their revenues on food and retirees, 85 percent (Moscow TRUD 24 Sep 1994). But today because of inflation 7[illegible] percent of workers earn less than is required for basic subsistence (Moscow TRUD

3 Feb 1994, Moscow IZVESTIYA 5 Feb 1994). Unemployment, strikes and delayed wage payments have further compromised the population's ability to purchase food (Moscow INTERFAX 22 Feb 94, TRUD 19 Feb 94).

Russians coped by changing the composition of their diets. Consumption of meat, butter, vegetables and fruit dropped 75 percent, while that of potatoes and bread products increased (Moscow TRUD 24 Sep 1994). The fat content of Moscow waste water declined sharply to wartime levels, a finding said to indicate poor nutrition (Moscow TRUD 3 Feb 1994).

Widespread nutritional deficiencies resulted (Moscow TRUD 3 Feb 1994). The Russian diet is now 25 percent deficient in protein, 50 percent deficient in vitamin C and 20-30 percent deficient in A and B vitamins (Moscow TRUD 24 Sep 1993). It also lacks sufficient carbohydrates. Sixty percent of children responding to a republic-wide poll said they usually do not get enough to eat (TRUD 3 Feb 1994). Thirteen percent of low-income Russians suffer from true malnutrition (Moscow IZVESTIYA 5 Feb 1994), while borderline malnutrition affects a third of the total population (Moscow TRUD 24 Sep 94).

Women, children and the elderly seem to be particularly vulnerable. Nutritional deficiencies are reputed to have caused a sharp rise in maternal deaths in 1991-1993 (Moscow TRUD 24 Sep 93). Only one child in four enjoys normal health, and half of young children are thinner than normal. Kurgan Oblast children have reportedly fainted from hunger (TRUD 3 Feb 1994). TRUD cites several starvation deaths and suicides apparently motivated by malnutrition. The Krasnodar emergency service recently found the corpse of a starvation victim on the street. The Moscow Main Medical Administration recorded two starvation deaths in Moscow in 1993, a tramp and an elderly woman. Tragically, a Moscow mother unable to feed her son suffocated him and attempted suicide. Autopsies of four elderly suicides in St. Petersburg detected no trace of food in their stomachs (TRUD 3 Feb 1994).

Unaffordability of food, rather than lack of it, may be the key to the present crisis. Although food production declined in 1993 (Moscow TORGOVAYA GAZETA 18 Jan 94), agricultural products went unsold (Moscow ROSSIYSKIYE VESTI 6 Jan 94). Deputy Prime Minister Zaveryukha acknowledged that his country's 6-8 million ton grain surplus resulted from reduced consumer demand (Moscow INTERFAX 16 Mar 94). According to Deputy Agriculture Minister Vladimir Shcherback, declining consumption was the reason farms reduced herds of livestock and left much of the potato crop unharvested (Moscow ROSSIYSKIYE VESTI 6 Jan 94).

Next year promises to bring smaller crops and higher food prices. New tariffs on food imports may inflate food prices (Moscow INTERFAX 16 Mar94). Shcherbak predicted that credit costs will reduce the acreage sown and raise the price of agricultural products (Moscow ROSSIYSKIYE VESTI 6 Jan 94). These factors suggest that both food prices and malnutrition will continue to rise in 1994.

Eye Disorders Caused by Chernobyl Accident

[OFTALMOLOGICHESKIY ZHURNAL, No.3, May-June 93]

[Editorial Report] The Odessa periodical OFTALMOLOGICHESKIY ZHURNAL contains five articles on ophthalmic pathologies caused by exposure to ionizing radiation released during the Chernobyl accident. Studies of individuals who either participated in post-accident clean-up or reside in the contaminated zone indicate that they are at increased risk of a variety of eye disorders, including cataracts.

Several of the reports indicate that radiation may be initiating a variety of ophthalmic problems in children. In 52.1 percent of 6896 children who live in the Chernobyl radiation contamination zone, researchers L. A. Sukhina, A. F. Smirnova, S. V. Chubar and Ali Zorkot found ophthalmic disorders such as refractive anomalies, chronic blepharoconjunctivitis, pigmented neoplasms of the mucosa, opacification of the lens, and edema of the optic nerve and retina. In many cases pathologies were initially detected after radiation exposure and may have been caused by it. The researchers found a much higher incidence of pathologies than were detected in a 1985 study of Ukrainian children, in which 6.1 percent had ophthalmic disorders.

These findings about children are supported by animal studies. Rats chronically exposed to increased levels of ionizing radiation from the Chernobyl accident experienced dystrophic, adaptive and proliferative changes in the retina, concluded N. Ye. Dumbrova and N. I. Nesteruk. Young rats brought into the contaminated zone suffered greater changes than rats that had always lived in the zone. The cytoplasmic structures of the photoreceptor were the earliest cells affected and the most susceptible to damage. The researchers predict that individuals exposed to radiation will experience slowly or rapidly progressing dystrophic processes in the retina or exacerbation of existing pathologies. In a study conducted on newborn rats, N. N. Bushuyeva and N. Ye. Dumbrova found that radiation of the thymus gland causes destructive changes in the connective tissue of the sclera that may initiate the development of myopia or promote its progression. The authors propose long-term mass screening of children and adolescents in high radiation zones.

Radiation from Chernobyl may also be causing premature aging of the eyes. A study of senile cataracts in Ivano-Frankovsk District has revealed a 35 percent increase during 1988-1993. M. T. Shkromida, M. A. Mosyak, R.V Boychuk, and T. N. Senyuk found cataracts to be most frequent (9.1-9.8 per 10,000 population) in zones with the highest radioactivity levels. A higher incidence was found in the Subcarpathian and Dniester regions (8.3-9.5 patients per 10,000 population) than in the Carpathian region (3.1-4.3 patients per 10,000). Cataracts developed in younger individuals in the Dniester region than in Carpathia.

Even low, legally permitted doses of ionizing radiation can lead to senile cataracts and premature aging of the lens, concluded B. Sh. Lazaretnik, Yu. V. Bakbardin and A. V.

Grebennik after a comparative study of Chernobyl clean-up participants, contaminated zone residents, and control groups. They also found that these ophthalmic changes can serve as an indicator of overall accelerated senescence caused by radiation exposure and manifested as chronic degeneration and inflammation of the upper respiratory tract, and neurasthenia. This report notes that other radiation-induced eye disorders identified in previous studies of Chernobyl victims include vascular changes, alterations in the ocular adnexa, and optic nerve pathologies. These reports indicate that ophthalmic problems caused by Chernobyl will be a growing problem for Ukraine. Most of the articles propose additional research, as well as long-term screening, prophylaxis and treatment of populations in zones with increased radiation levels.

Russian Scientists Propose Program On Mass Mushroom Poisonings

00000000 [ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII, in ????????? Dec 93, etc.]

[Editorial Report] Russian experts are trying to determine the cause of mysterious mass mushroom poisonings which occurred in Voronezh Oblast in 1992, according to a report in the Russian public health journal, ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII (Dec 93). A group of scientists from the Voronezh Oblast State Sanitation and Epidemiology Inspectorate, the Kurchatov Institute, and the Scientific Research Institute for Preventive Toxicology and Disinfection propose funding the eight-million ruble program from Voronezh Oblast funds earmarked for ecology purposes.

In 1992, 335 Voronezh residents were poisoned and 24 died (Moscow ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII Dec 93). The outbreak stunned local toxicological centers and prompted oblast authorities to prohibit the sale and processing of mushrooms (Moscow MEDITSINSKAYA GAZETA 17 Nov 92).

Extensive studies by prominent institutes failed to identify the substance responsible for the poisonings, the journal said. Possible sources of contamination considered were radioactivity, heavy metals, agricultural chemicals, microorganism toxins, and toxins created during cooking. Researchers also thought that warm weather may have altered the appearance of poisonous mushrooms so that they resembled edible species. Studies were conducted at the Volgograd Scientific Research Institute of Toxicology, Occupational Pathology and Medical Prevention of Chemical Poisoning, the Komarov Institute of Botany in St. Petersburg, the Kurchatov Institute in Moscow, the Voronezh Oblast Epidemiology Center, and the Institute of Toxicology in Yekaterinburg.

Previous press accounts reported that animal tests revealed "strong toxins" in the Voronezh mushrooms (Moscow ITAR-TASS 7 Aug 92, Moscow Russian Television Network 12 Sep 92). The medical newspaper MEDITSINSKAYA GAZETA (Moscow 12 Aug 92), however, noted that tests had failed to find either toxic substances or heavy metal salts in the fungi. MEDITSINSKAYA GAZETA also noted speculation that edible mushrooms had mutated to produce a new toxin. In 1993, the Russian State Committee for Sanitary and Epidemiological Supervision claimed that death cap mushrooms had been definitively identified as the cause of all fatal cases of mushroom poisoning in Voronezh and other oblasts (IZVESTIYA 14 Aug 93).

Similar mass mushroom poisonings have occurred elsewhere. In 1991, Lugansk, Donets, and other regions of Ukraine experienced over 400 cases and 40 fatalities (Moscow ITAR-TASS 7 Aug 92). Krasnodar Kray registered over 330 cases of mushroom poisoning and 40 deaths during the same year (Moscow TRUD 4 Mar 93). The author of the ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII article, Voronezh epidemiologist T. Chubirko, thinks comprehensive studies should be done in these areas as well.

Luminescent Dinoflagellata of Black Sea and Influence of Anthropogenic Factors on Them

947C0244a Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 4, Jul-Aug 93 [Manuscript received 25 Jun 92] pp 27-34

[Article by E. P. Bityukov, P. V. Yevstigneyev, and Yu. N. Tokarev, Institute for Biology of Southern Seas, Sevastopol; UDC [593.162:574.64](262.5)]

[Abstract] The Laboratory of Bioluminescence and Bioacoustics of the Institute for the Biology of the Southern Seas, Ukrainian Academy of Sciences, in Sevastopol, has been studying the bioluminescent species of the Black Sea since 1965. Thirty-eight bioluminescent dinoflagellates have been identified, of which 13 were previously reported in the literature. The basic energetic parameters of the emissions exhibited by 30 of the species are tabulated. Changes in these parameters can serve as powerful indicators of anthropogenic pollution. The amplitude of the emission of Noctiluca miliaris changes with varying concentrations of phenol, PCB, or petroleum, or on exposure to gamma radiation. Chronic 35-day exposure was always found to convert initial stimulatory effects to inhibition. The early changes exhibited an oscillating nature, due to acclimatization. The amplitude of bioluminescence was found to be lowest at the center of the Sevastopol bay and highest ten miles from shore, with samples taken at five miles giving intermediate values. Heavy metals and other toxins may cause this change by decreasing the number and activity of scintillons, eliciting membrane degeneration, or inhibiting necessary enzyme systems. Figures 2; references 28: 17 Russian, 11 Western.

Cytophysiological Method for Rapid Evaluation of Toxicity of Natural Waters

947C0244b Kiev GIDROBIOLOGICHESKIY ZHURNAL in Russian Vol 29 No 4, Jul-Aug 93 [Manuscript received 4 May 92] pp 95-101

[Article by N. N. Smirnova and L. A. Sirenko, Institute of Hydrobiology, Ukrainian Academy of Sciences, Kiev; UDC [581.526.3:574.64](28)]

[Abstract] A method for the rapid determination of toxic agents in natural freshwater was developed using the rate of

protoplasm rotation in Vallisneria spiralis L. Microscopic observations were conducted on prosenchymal cells taken from areas near the central vascular fiber sheaf of Vallisneria leaves exposed to water samples fr 1-1.5 hours at 20°-24°C, using the chloroplasts as markers of protoplasm movement. Weak toxicity elicited 20%-50% decreases in movement or 20%-80% increases. Moderate toxicity caused decreases of 50%-80% or increases of 80%-150%. Severe toxicity was seen at decreases of 80%- 90% and increases of 150%-200%. Decreases of more than 90% and increases of more than 200% were lethal. Severe and lethal toxicity was accompanied by observable structural changes in the cells. Samples taken from the Dunay River in 1988 gave varying results, from 311% to 0. The stimulatory effects seen in the upper portions of the river were due to the presence of phosphates in the water. Tests conducted in 1991 on the Dneper Reservoir did not demonstrate any severe or lethal toxicity. Weak or moderate toxicity was characteristic of the bottom layers of dam head races, as well as various inlets small river mouths. Method response was determined as a function of the concentrations of Mn, Cu, Zn, and Ni. The data obtained demonstrate the suitability of the method for evaluating the quality of natural and waste water, as well as for screening new biologically-active compounds. Figures 4; references 7 (Russian).

Effect of Higher-Level Ionizing Background Radiation on Barbate Birch in Zone of Chernobyl Nuclear Power Plant Accident

947C0257A Yekaterinburg EKOLOGIYA in Russian No 5, Sep Oct 93 (manuscript received 7 Aug 91) pp 40-45

[Article by P.I. Yushkov, I.A. Chuyeva, and N.V. Kulikov, Institute of Plant and Animal at Russian Academy of Sciences, Urals Department; UDC 577.391:582.632.2]

[Abstract] Following the Chernobyl accident in April 1986, during the remainder of this year there were recorded no morphological changes in leaf trees but was recorded a [illegible] of needle trees within the zone of heavy [illegible] and fires within a 30 km radius from the site of the [illegible] power plant. Experiments have meanwhile indicated that symptoms of radiative damage including lethal [illegible] may become evident not immediately after such an event but somewhat later. More than a year later, the [illegible] made concerning the delayed effect of higher-level ionizing gamma background radiation on the generative and vegetative organs. Tests were performed in July-August 1987 on birch trees (Betula verrucosa Ehrh.) in three pine-birch woods located one 18 km south-[illegible] south-east of, and 1.5 km west of the [illegible] irradiation with 100-150 gR doses of gamma rays was found not to have lowered the germinating capacity of birch seeds but to have reduced the viability of seedlings, parts of the latter grown from irradiated seeds having fallen off by the end of a 25 days long test. Most [illegible] be seedlings farthest from and south of the nuclear power plant. Based on a statistical analysis of germination energy and and seedling viability [illegible] the [illegible] of this tree species to irradiation has been classified into three grades: 1) treetop, leaves, and aments not revealing any significant signs of damage after a 3.0 mR/h dose, 2) entire treetops remaining alive and no loss of reproductive capability, but teratological changes such as bifurcation or contraction of some aments after a 20-40 mR/h dose; 3) loss of reproductive capability, partial or complete defoliation of branches, loss of chlorophyll at the edges of leaf blades after a 250 mR/h or larger dose. The larger than expected mass, i.e., number of seeds on trees exposed to higher-level background radiation is partly attributable to a smaller fraction among them of "empty" parthenocarpic ones, while stimulated action of small radiation doses coming from external sources and from radionuclides embedded in aments may be partly responsible for the higher germination energy. The higher resistance of such seeds to damaging gamma radiation indicates that may they have acquired some immunity during buildup and storage of small radiation doses, their large size possibly being another contributing factor. Figures 2; tables 4; references 9.

Metabolic Reactions and Peroxide Oxidation of Lipoids in Preschool Children During Aggravation of Ecological Situation

947C0233A Moscow GIGIYENA I SANITARIYA in Russian No 5, May 93 pp 37-39

[Article by Z.V. Zabrodina, L.G. Gorokhova, Ye.I. Ukonova and V.A. Petrova[Pediatrics Institute, East Siberian Branch, Siberian Department, RAMN [Russian Academy of Medical Sciences], Irkutsk]; received Feb 12 92, UDC 616.253.915-39]-053.6:612.614.7]-07]

[Abstract] 96 children (52 girls and 44 boys [illegible] years old, were examined during the aggravation of the ecological situation in the Central rayon of the city of Bratsk at the beginning of 1991. The ecological situation was aggravated by accumulation, due to calm weather, of industrial emissions of a timber industrial complex, aluminum smelting plant and thermoelectric power plant. The article calls the situation an "ecologic explosion". The obtained data were compared to the data of a similar 1990examination of 82 children (41 girls and [illegible] in the same age group, when the air situation was relatively [illegible]. Protein, carbohydrate and lipoid metabolisms, peroxidized lipoid oxidation (PLO) processes, the activity of [illegible] enzymes (catalase andperoxidase) and peroxide hemolysis of erythrocyte resistance (PER) were studied. The detected metabolic responses in preschool children during the especially unfavorable ecologicalsituation indicate a considerable strain of their homeostasis. The concentration of malonic dialdehyde, an end product of PLO, in blood plasma and erythrocytes hadincreased, while the activity of antioxidant enzymes (catalase and peroxidase decreased). The described children's metabolic responses demonstrate functionally unfavorable changes and the possibility of transformation of adaptation-adjustment responses into initial stages of pathological conditions. Tables 3; references 9.

Effect of Secondary Dust Transfer of Radioactive Substances on Contamination of Settlements in Chernobyl Accident Zone

947C0233B Moscow GIGIYENA I SANITARIYA in Russian No 5, May 93 pp 39-41

[Article by N.A. Loshchilov, V.A. Kashparov and V.P. Protsak (Ukrainian Agricultural Radiology SRI, Kiev) under the "Radiation Hygiene" rubric; received 8-27-92; UDC 614.73+[illegible]]

[Abstract] When planning measures aimed at decontamination of settlements in the territory contaminated with radioactive substances as a result of the Chernobyl AES (ChAES) accident one should take into account the possibility of secondary radioactive contamination caused by various factors (wind transfer, horizontal migration [illegible]

[illegible]

Analysis of Eye Damage by Laser Radiation: Substantiating Coefficient of Interspecific Extrapolation

[illegible]

the above parameters is higher than average eye immunity of rabbits and monkeys by a factor of not more than 2.8 - 2.1 mean with a mean deviation of plus or minus 0.7. This can be considered the maximum CIE value when determining maximum allowable levels of laser radiation based on data of experimental studies of laboratory animals. Tables 1, references 16: 6 Russian, 10 Western.

On Procedure for Restoring Concentration for Group of Aerosol Dispersivity Ranges Under Conditions of Industrial Technology Air Pollution

947C0233D Moscow GIGIYENA I SANITARIYA in Russian No 5, May 93 pp 60-61

[Article by V.M. Malykhin and S.A. Toropov (Sea Transport Hygiene SRI, St.Petersburg), received 5-20-92; UDC 613.632.4:[illegible]]

[Abstract] Air environment in electronic industry production premises and hermetically sealed production equipment (HSPEs), which form a closed ecosystem, [illegible] production [illegible] personnel [illegible] product quality. It is [illegible] necessary to [illegible] systems [illegible] is also [illegible] prevent [illegible] personnel's organ- [illegible] aerosol particles that can [illegible]

[illegible]

Embryo Response to Low Frequency Rotating and Alternating Electric Fields

[illegible]

EV [illegible] vertical EF component). A description and the electrical schematic of the experimental device is presented. It was determined that epidermis is affected by EP and responds to EP action by stabilizing geometric parameters. Tumors were detected in animals that had spent long time in EFs (mainly in REFs). In explaining mitotic activity of epidermis cells in these animals the author proceeds from the assumption that induced currents are the main factor in the effect of low frequency electromagnetic fields. The main process of EF (currents) interaction in a biological object takes place on the tissue and cell levels. The organism possesses effective protection against external low frequency EFs. Acceleration of rigor mortis had been detected in animals that spent at least 1.5 months in an EF. There is no principle difference between high intensity industrial frequency alternating and rotating electric fields. It is concluded that low frequency EFs warrant further studies. The author contends that it is necessary perform separate [illegible] of the time spent in an EF for REFs and AEFs. Figures 2; tables 2; references 18: 14 Russian, 4 Western.

Monitoring Toxicity of Ecosystem in Kerch Straight under Conditions of Dumping

[illegible] *EKOLOGIYA in Russian* [illegible]

[illegible] I.M. [illegible] and I.S. [illegible] Institute of [illegible] Kerch; UDC [illegible]

[illegible] including [illegible] Kerch Straight [illegible] of the Black [illegible] mussel [illegible] but also [illegible]

sampling sites were respectively: 1) 0.041 and 0.044 mg/liter, 2) 0.026 and 0.027 mg/liter, 3) 0.020 and 0.024 mg/liter. The absence of polychlorobiphenyls facilitates massive accumulation of insoluble organic chlorine compounds and their adsorption by particles suspended in deeper water. Their spatial overall distribution of organic chlorine indicates that they do not spread far to the north into shallow shelf water. Figures 2; tables 1; references 6.

Effect of Copper Smelting Activity on Soil Mesofauna

947C0257D Yekaterinburg EKOLOGIYA in Russian No. 5, Sep-Oct 93 (manuscript received 27 Apr 92) pp 83-85

[Article by L.S. Nekrasova, Institute of Plant and Animal Ecology at Russian Academy of Sciences, Urals Department; UDC 502.5:595.765.4]

[Abstract] An ecological study in the region of the Karabash Copper Smelting Combine was begun in 1986, of concern being the effect of this industry on the mesofauna habitating in the soil. Soil specimens, 30x50x50 cm^3 large clods, were dug up according to standard procedure at five sites: four sites respectively 1.5-2.5-6.0-15 km south-east away from the factory in the direction of the dominant winds, the nearest site being a treeless hill, and one site 8 km north-west (against those winds) away from the factory. Generally, the total biomass and the numbers of animals were found to become smaller with decreasing distance from the pollution source. Noteworthy is the effect of industrial fallout on the taxonomic structure of the mesofauna: ants dominant 1.5-2.5 km SE, earthworms dominant 15 km SE, both species and [illegible] equal numbers 8 km NW, earthworms and [illegible] along with click beetles still found 6 km SE [illegible]. Presence and absence of these species can serve as [illegible] establishing the boundary of the [illegible] a copper smelting plant. [illegible] three successive soil layers yielded pH [illegible] cm deep top layers and pH 5.6-6.4 [illegible] lower layers at the sites [illegible]. Only the number of ants was found [illegible] acidity of the top soil [illegible] [illegible] Figures [illegible]; references 11.

Condition of the Eyes of School Children From Senior Classes in Ukraine

[illegible] *OFTALMOLOGICHESKIY ZHURNAL in Russian* [illegible]

[Article by [illegible] L.V. [illegible] [illegible] Scientific Research Institute [illegible] UDC [illegible]]

[Abstract] In order to identify the contingent of students from senior classes in Ukraine who have eye pathologies and need special medical and social care, the researchers here used traditional clinical and ophthalmological methods to examine 5,786 eighth- and ninth-grade students from 11 public education schools, seven special schools for the blind and vision impaired, and two schools for the deaf and hearing impaired in 11 oblasts. Their examinations indicated that 89 percent of the school children have essentially healthy eyes and no contraindications for any of various kinds of production work. Such students included those with uncorrected visual acuity of 0.6-0.8 and corrected acuity of 1.0. Only a small percentage of students in the public schools (0.2 percent) had pronounced visual problems, i.e., corrected visual acuity of 0.5 or lower in the better eye. That represents some 1,500 students graduating from the ninth grade each year. In all, 6.3 percent of those who graduate need some correction of their vision. Myopia is the pathology most frequently encountered among the public school students; those with [illegible] myopia, however, account for only 0.2 percent of the graduating students. Virtually all the students found to have severe eye problems were from the special schools. References 10: 9 Russian, 1 Western.

Results of Medical Exams of the Visual Organs of Rural Children in the Radiation-Contaminated Area of Chernigov Oblast

947C0??? [illegible] Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 5-6 1992 (manuscript [illegible]) pp [illegible]

[Article by M. S. [illegible], docent, and A. M. Petrunya, physician, Department of Ophthalmology, Luganskoye Medical Institute; UDC [illegible]]

[Abstract] Between March [illegible] and [illegible] April 1991, in 10 [illegible] of [illegible] Rayon, a total of [illegible] children [illegible] were examined by [illegible] from the Ministry of Health of Ukraine [illegible] pathology was [illegible] the most [illegible] [illegible] was [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] percent of [illegible] [illegible] [illegible]

Decontamination of Equipment

[illegible]

[illegible]

[illegible] a standard for safe use, repair or removal of equipment from the 30-km zone around the Chernobyl atomic energy plant. This is because the many colloid chemical and phsicochemical processes which occur during decontamination have not been sufficiently studied. This article studies in detail various colloid chemical processes that occur in decontamination and develops highly effective decontamination solutions based on domestically produced industrial reagents. The new decontaminant agents yielded a factor of 2-10 increase in the coefficient of decontamination. The best solution consisted of oxalic acid (0.3-01.0 % by mass), ethylenediaminetetraacetate (0.2-0.3%), oxalate of ammonia (0.1-0.2%) and SF-2U (a wetting agent, 0.2-0.3 %) in water. The composition of the wetting agent is given. The example of cleaning transmission parts coated with burnt-on oil is given. Tables 2, references 15 (Russian).

Radiation Resistance of Populations of Mollusks from Waters with Various Levels of Radioactive Pollution

947C0212 Moscow DOKLADY AKADEMII NAUK in Russian Vol. 329 No.5, Apr 93 (manuscript received 15 Dec 92) pp 677-679

[Article by N. N. Khmeleva, A. P. Golubev, A. Ye. Plenin, Institute of Zoology, Academy of Sciences of Belorus, Minsk; UDC 594.3+504.054:539.16]

[Abstract] This article presents a comparative analysis of the radioactive sensitivity of populations of a type of Pulmonata, Lymnaea stagnalis, obtained from bodies of water in the region polluted by the Chernobyl atomic energy plant and from unpolluted regions. According to various estimates, the radioactive sensitivity of mollusks is a factor of 20-30 lower than in mammals. Consequently, the processes of radioactive adaptation in their populations may be governed by different rules. The study was done in the summer of 1991. Polluted samples were taken from the Pripyat River 15 km upstream from the Chernobyl plant. Control samples were obtained from the Krutynya River in Poland. Ground pollution [illegible] the content of radioactive isotopes (Cs, Sr) were [illegible]. Adult mollusks were exposed to gamma radiation and observed. Two distinct mortality processes were found. This indicates the presence of two independent reactions to radiation with different mechanisms [illegible] fatal. The first occurs fairly rapidly, the second [illegible] slowly. The Pripyat samples withstood [illegible] better. In the second phase, the control samples [illegible] better. Mollusks surviving the first phase [illegible] eggs. The appearance of mutations [illegible] [illegible] table 1, references [illegible] (Russian).

Ophthalmoergonomics in Ukraine

947C0??? Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No [illegible]

[Excerpts from [illegible] by V. V. [illegible], candidate of the medical sciences, Scientific-Research Institute of Preventive Ophthalmology and Ophthalmoergonomics of the Kharkov [illegible] [illegible]

Technical Support Service, Kharkov; signed to press 26 Oct 93 UDC 61[illegible]613.6(477)]

[Text] The birth of ophthalmoergonomics as a science was brought about by a profound change in the nature and conditions of human visual activity in all types of industry due to an increase in visual stress, the development of new technologies requiring strong visual resolution, and the broad application of non-verbal communications systems, including visual information-display systems. Environmental changes that pose human health hazards also fall within the scope of ophthalmoergonomics.

All adult age categories have seen a considerable rise in the number of cases of visual disorders that seriously impair visual acuity and negatively affect the quality and efficiency of visually intensive types of labor. The severity of these impairments varies from minor visual discomfort to complete disability in the performance of visual work. There are numerous cases in which the manifestation of clinical symptoms could, with complete justification, be diagnosed as "visual strain syndrome."

Ophthalmoergonomics exists at the intersection of the [illegible] of ophthalmology, ergonomics, and labor [illegible]

If the task of ophthalmology is to diagnose and treat [illegible] to the eye, then the purpose of [illegible] is to prevent the development of [illegible] in the visual organ as a result of [illegible]. This objective is realized by care[illegible] particular occupation and its atten[illegible] affect human visual function, by [illegible] relationship between the initial health of [illegible] and their response to these effects, and by [illegible] for visual activity. Thus, the [illegible]

- [illegible] procedures and tests for [illegible] different types of [illegible]
- [illegible] between the functional [illegible]
- [illegible]
- [illegible]
- [illegible]

[illegible]

vision and visual function in people who perform very close visual work. They have established and are developing a new field—design engineering ophthalmoergonomics. This is a new field not only in ophthalmoergonomics, but in labor physiology as well.

An important branch of the ophthalmoergonomic sciences is the study of the visual health and acuity of people who work with video displays. Ukrainian researchers have made their contributions to this field as well.

Transportation ophthalmoergonomics, especially as it applies to marine transportation systems, has also been studied.

Ukrainian ophthalmology has traditionally emphasized the study of the visual structures of children and adolescents. An important aspect of this research has been the attempt to study the relationship between visual health and pathology and the conditions under which the visual analyzer functions. The field of ophthalmoergonomics as it applies to school-age children was founded in Ukraine.

Method for Assessment of Microbial Contamination of Air

947C0234A Moscow GIGIYENA I SANITARIYA in Russian No. 5, May 93 (manuscript received 28 Feb 92) pp 71-72

[Article by Ya.F. Kotenok and O.G. Gavrilov, Pedagogical Institute imeni V.I. Lenin; UDC 614.718-078]

[Abstract] A portable device has been designed for bacteriologic air sampling at positive and negative temperatures. The device (M-15) consists of an intake [illegible], an aerosol generation chamber, and a chamber for [illegible] bacteria on neutral granules coated with [illegible] solution for adhesiveness. Subsequent [illegible] and routine bacteriology [illegible] [illegible] meter of air. Figures [illegible] table; [illegible] references [illegible]

Ultrastructure of Nerve Cells of External Geniculate Body After Removal of Field 17 of Visual Cortex and Transplantation of Embryonic Nerve Tissue

[illegible]

[illegible]

[illegible]

to chronic retrograde changes. In studying semifine sections of brain tissue of a recipient with a neurotransplant one was able to see that the transplant was filling up the artificial cavity. Even 10 and 18 months after the removal the majority of nerve cells had practically normal structure. The results of the studies presented in the article demonstrated that one removal of field 17 of the brain of adult rats results in retrograde changes and the death of some EGB neurons within several weeks, while embryonic transplant of telencephalon prevents destructive processes in EGB neurons even long after the transplant operation. Figures 1, references 12, 1 Russian, 11 Western.

Regenkur: Polymeric Adsorbent for Treating Purulent Lesions

947C0249A Moscow KHIRURGIYA in Russian No. 11, Nov 93 (manuscript received 29 Jun 90) pp 3-6

[Article by V.K. Gostishchev, prof., L.E. Mulyayev, A.V. Nikolayev, A.G. Khanin and V.Yu. Kassin, Chairs of General Surgery, 2nd Therapeutic Faculty, and of Operative Surgery and Topographic Anatomy, 1st Therapeutic Faculty, Moscow Medical Institute imeni I.M. Sechenov]

[Abstract] Clinical trials were conducted with the polymeric adsorbent regenkur (previously designated iselosorb, weakly crosslinked cellulose ester) in the management of infected wounds. The patient cohort consisted of 60 men and women 20 to 80 years old with a variety of infected soft tissue wounds. Conventionally treated patients (42) with analogous lesions served as controls. The [illegible] dressing was pretreated with 3% hydrogen peroxide and applied to wound surface in 2-3 mm thickness [illegible] by gauze. The number of changes per day [illegible] 4 for an average of 6.5. After 3 to 5 days [illegible] the experimental group showed significant [illegible] contamination followed [illegible] and 14. In second peripheral pathology [illegible] in the hospital stay of [illegible] by about in comparison [illegible] sorbents proved to be [illegible] of bacteria [illegible] of the system of adsorbent [illegible]

Effect of Drug-Treated Adsorbents on Wounds

[illegible]

HM dressing led to wound sterilization in 3 days (0% mortality), vs. 14 days in control animals (33% mortality) managed in a conventional manner. Clinical benefits with the combined dressing also exceeded those of dioxydin-HM dressing alone. However, although the length of time required for complete epithiliazation did not differ in the control and experimental groups, these observations suggest that the combined HM may have application in human medicine in controlling wound infections. Tables 3; references 3 (Russian).

Treatment of Pyoseptic Conditions With Xenogeneic Splenic Perfusions

947C0249C Moscow KHIRURGIYA in Russian No. 11 Nov 93 (manuscript received 29 Jan 92) pp 10-15

[Article by A.A. Makarov, cand. med.sci., A.B. Tsypin, prof., G.A. Vityazev, O.A. Dolina, prof., A.Yu. Polonskov, V.S. Suskova and V.Ya. Prokhorov, doctors of med. sci., and B.M. Manuylov, cand. biol. sci., Moscow]

[Abstract] Intravenous administration of a solution prepared by perfusing pig liver with physiologic saline significantly was shown to reduce mortality of mice and dogs with experimental sepsis due Staphylococcus aureus infections. Based on these results, analogous trials were conducted on 45 male and female patients, [illegible] years old with life-threatening pyoseptic conditions. The infusions were prepared by using dextran, 10% glucose, [illegible] nous blood to perfuse the porcine spleen. The [illegible] regimen consisted of 400-500 ml (2-4 ml·min drip) [illegible] the solution given 1-6 times at 1.5 day [illegible] after a surgical intervention. The benefits [illegible] xenogeneic splenic therapy were most [illegible] patients with destructive appendicitis [illegible] purulent peritonitis. Only 3 (18.8%) [illegible] gors died vs. a 26.7% mortality [illegible] In general, this therapeutic approach [illegible] patients with necrosis of the process [illegible] overall impression of this [illegible] positive one and the [illegible] ration and enhancement [illegible] splenic substance [illegible] intestinal canal [illegible] patients [illegible] [illegible] Western.

Impact of Xenogeneic Splenic Homog[illegible] Infected Wounds

[illegible]

discharged from the hospital on an average of 13.0 +/- 0.1 days earlier than the control subjects. Cytologic and bacteriological workups demonstrated that in the experimental group pus disappeared within an average of 3.0 +/- 0.1 days and granulation tissue appeared in 4.0 +/- 0.4 days, whereas in the control group analogous manifestations required 9.0 +/- 0.4 and 8.1 +/- 0.2 days, respectively. In general, the effects were attributed to absorptive capacity of the homogenates for bacteria, their metabolites and cell detritus, as well as anti-inflammatory factors. Tables 1; references 3 (Russian).

Antimicrobial Activity of Wound Discharge as Indicator of Wound Healing

947C0249L Moscow KHIRURGIYA in Russian No. 11, Nov 93 (manuscript received 12 Dec 91) pp 19-23

[Article by O.S. Kochnev, prof. (dec.), S.G. Izmailov and R.V. Fedorov, Chair of General and Emergency Surgery and Microbiology, Kazan GIDUV [expansion unknown]]

[Abstract] Zone inhibition studies were conducted on Micrococcus lysodeicticus to test wound discharges for antimicrobial activity and to ascertain whether such activity provides an indication of wound healing. The technical details involved preparation of 5 mm diameter discs from filter paper for saturation with the discharge material and assessment of growth inhibition on solid medium. Studies on 70 male and female patients, 18 to 70 years old, with postsurgical abdominal infections demonstrated a positive correlation between the degree of inhibition and [illegible] of the infectious process. Thus, a [illegible] of the discharge can be [illegible] of antimicrobial therapy and [illegible] secondary sutures. [illegible] (Russian).

Cell Cultures in Local Treatment of Burns

[illegible]

Leading Causes of Death in Ukraine Reported

944K1030A Kiev ZELENYY SVIT in Ukrainian No. 4, Mar 94 p 4

[Report by V.P. Voytenko and Ye.M. Libmanova (Based on Materials of the Ecodefenceinform Agency): "Mortality and Life Expectancy in Ukraine"]

[Text] **A conference entitled "Ecology, Health, and Old Age" was held quite recently at the Gerontology Institute of the Ukrainian Academy of Medical Sciences in Kiev. Taking part in this conference's work were staffers of the scientific organs under the Ukrainian Academy of Sciences and Academy of Medical Sciences, as well as those from the Ukrainian Ministry of Education. Twelve reports by prominent specialists in the fields of ecology, medicine, and gerontology were discussed here. The conference's goal was to thoroughly analyze the consequences of the ecological situation which has evolved in Ukraine and which has evoked deep concern. This conference also had the goal of discussing possible ways to extricate ourselves from this crisis-type situation. The initiator for holding this conference—the Gerontology Institute—hopes and anticipates that the most adequate ways will be found for overcoming the symptoms which menace our nation's health. This hope likewise unites the efforts of scientists in various fields and practicing specialists.**

Press Center of the Ukrainian Health Center

According to data published by the World Health Organization in 1990, Ukraine ranks [illegible] average life expectancy for women [illegible] men

The principal cause of death [illegible] eases of the circulatory system [illegible] dying from these diseases [illegible] earlier. The greatest [illegible] foreign counterparts [illegible] [illegible]

Domestic Product (GDP) and personal consumption (PC) by 1,000 "international dollars" would allow an increase in life expectancy of 0.5 years for men and 1 year for women. But this ratio is not absolute. The greatest life expectancy is not in the United States (which ranks first in personal consumption), but rather in Japan (which ranks 22nd in personal consumption). That is to say, extra-ecological factors are also of essential importance, in particular, life style and the nature (not merely the quantity) of the personal consumption involved. This furnished optimism for those who are poor.

Most urgent for Ukraine is investing in the preservation and safeguarding of nature, even though restoring the environment to good health will not have an effect on mortality very soon.

Prognosis

The Central Region (the city of Kiev, as well as Poltava, Chernigov, Zhitomir, Sumy, Cherkassy, Vinnitsa, and Kiev oblasts) is characterized by a relatively favorable mortality structure-one closely approximating international standards. Serving as a foreign analogue to the mortality pattern here could be Belgium during the early 1960's (for men) and during the late 1970's (for women).

The Western Region (Lvov, Khmelnitskiy, Chernigov, Ivano-Frankovsk, Ternopol, Volyn, Rovno, and Zakarpat oblasts) slightly exceeds the average level for Ukraine with regard to life expectancy. However, it is progressing quite slowly. The unfavorable mortality trends in Zakarpat [illegible] demands for doubting the [illegible] of the positive statistics on this oblast [illegible] Ivano-Frankovsk and Volyn oblasts. Among the European countries [illegible] Latvia during the early [illegible] (for women).

The Eastern Region (Donetsk, Dnepropetrovsk, Kirgizov [illegible] Voroshilovgrad) [illegible] the highest [illegible] a lowering of [illegible] PC [illegible]

The Southern Region [illegible]

Health Consequences of Chelyabinsk Nuclear Testing, Accidents Viewed

[illegible] Ukrainian People's Deputy Volodymyr Yavorivskyy [illegible] recently received a letter which related the fate suffered by the forstages of the Urals Chernobyl—the Mayak Industrial Combine. Volodymyr Oleksandrovych [illegible] this letter to the newspaper, as its author had requested. We offer it here for your attention.

Dear fellow-countrymen!

I am writing to you from the distant Ural city of Chelyabinsk. I was born near Kherson, studied at Odessa University, worked for 11 years at the Odessa Polytechnical Institute, and I have been here for 26 years—at the Chelyabinsk Technical University.

My older children and grandchildren are Ukrainians, whereas my younger daughter is Russian; I have brothers and sisters living in Kiev, Kherson, Odessa, and Moscow. Both Ukrainian and Russian cultures are near and dear to me. In my soul and in my consciousness Russians and Ukrainians are fraternal peoples.

I want to tell you about the Chelyabinsk tragedy so that you may know what is menacing you.

Some 45 years ago in this short-lived "Ural Switzerland" an enterprise began to be built for the purpose of making an atom bomb. The best minds of our nation were brought here, and they worked self-sacrificingly, believing in the need to create an atomic shield for our Fatherland. This plant was built in record time.

But the technology of radiation safety was still at a very low level at that time. Plutonium was carried about in glass vessels, adulterated radioactive wastes were poured into the small Techa River, on the bank of which the "Mayak" Chemical Combine was situated. That came to be the name of the production association which produced nuclear weapons.

Thousands of nuclear specialists and service personnel perished during the first few years of Mayak's operation, and nobody has ever counted the number of people living around there who also were lost.

Finally, the authorities came to their senses and began to resettle people away from the river. They fenced it about with barbed wire and prohibited people from drinking its water, thereby [illegible] devastating their catchment. But to many locals they did not explain to people the reason for these prohibitions. And people used to drink contaminated milk [illegible] and used water from the [illegible] continued to [illegible]

happened to be on the territory of this radioactive trail was tragic. Without any explanations of the reasons for this, all such persons were herded into barracks; their clothing and personal effects were burned, and they were given different clothing. A ditch was dug, and bulldozers were used to dump everything in it together with the cattle and bury the whole lot. The people were hauled away and resettled in temporary buildings. And then they were forgotten.

The third significant accident at the Mayak Chemical Combine occurred in 1967. After the toxification of the Techa people began pouring RAO into man-made or natural lakes. In one such lake, in Karachay, RAO accumulated having an activity factor of 600 million Curie units (12 times greater than the amount emitted at the time of the Chernobyl disaster).

The summer of 1967 was a scorcher. The Karachay grew very shallow; the banks became denuded; the radioactive algae and mud dried up and turned into dust. The wind raised this lethal dust and and carried out about over an area inhabited by close to a half a million people.

Small or modest-sized accidents which occur—in the specialists' words—within the "regulated system" (that is, with discharges less than the allowable parameters) happen all the time and with great frequency. Thus, for example, on 17 July of last year there occurred a discharge at one subdivision of the Mayak Chemical Combine; and a slurry pipeline burst on 4 August.

The authorities reassure us that such discharges are less than the parameters of the allowable norms, but we doubt that the grounds justifying these norms are adequate. Furthermore, their frequency is so great that the sum total [illegible] to be significant.

For example, ground waters of our oblast contain a [illegible] RAO [illegible] an activity of 1 billion 300 million [illegible] approximately 26 Chernobyls [illegible]

[illegible]

[illegible]

Health Consequences of Mariopol's Environmental Contamination Viewed

[illegible]

member of the ZELENYY SVIT UEA (Ukrainian Ecodefenceinform Agency): "Why Are There So Few Happy Families in Mariopol?"]

[Text] During the first quarter of last year 800 marriages were registered in Mariopol, whereas 764 divorces were registered during this same period. According to data from a sociological poll conducted by a civic organization here, the principal reason for such "family" instability is the infertility and impotence of this city's human population. These factors have reached 60 percent and 33 percent respectively.

However, even if a family in Mariopol has a "real man," that does not necessarily mean that such a family will add a third or fourth member. The rate of stillbirths and infant mortality before the age of one year during the period 1989-1991 varied between 45 percent and 50 percent. Thanks to modern-day medicine, this indicator declined to 26 percent in 1992. But this was specifically due to ultrasonic diagnostics and the interruption of pregnancy in cases where anomalies were discovered. And this was already after nature itself had made a choice: From 1989 through 1992 the number of miscarriages increased from 24 to 32 per 100 pregnancies.

Nor can those families in which an infant has arrived always be called happy. Of each 1000 children, 22 are born with birth defects (for the sake of comparison, in Simferopol this indicator stands at 8).

At a time when the birth rate is declining, the mortality rate is rising. During the first quarter of 1993 it increased by 25 percent in comparison with this same period in 1992. But what do births and deaths have in common? The connecting link here is a cancer-treatment facility which was built for 90 beds but which now has 220.

This situation is dreadful, but it can be explained. This city with its 540,000 inhabitants provides 35 percent of Ukraine's steel and 30 percent of Ukraine's sheet metal. Mariopol also produces 90 percent of all kinds of septic tanks, as well as equipment for metallurgical and ore-[illegible] complexes. It carries out contracts for the Ministry of Medium Machine Building, and, in addition, has a plant producing medical equipment, as well as [illegible] enterprises. The Mariopol Seaport is the [illegible] of the Sea of Azov. [illegible]

[illegible]

[illegible] which include 75 percent iron compounds, [illegible] manganese compounds, and 1.2 percent zinc [illegible] have accumulated to the extent of more than [illegible]. People say that during the Soviet [illegible] wanted to acquire all of these [illegible] but the Soviet government refused—[illegible] gram of strategic raw material [illegible] to a potential enemy. And the [illegible] have been abandoned at two dump sites [illegible] acid has already been leaking for [illegible].

[illegible] of Mariopol drink can hardly be [illegible] small Northern Donets River, which [illegible] source of water here, is dreadfully polluted [illegible] station is not operating in [illegible] normative requirements. Its operators [illegible] add more chlorine than provided [illegible] still does not help the situation [illegible] are seeping into the system.

[illegible] was a health-resort area. But nowadays [illegible] closed down every year. Salmonela [illegible] near the waste-water discharge [illegible] and cholera bacteria have been [illegible] which winds its way through [illegible].

[illegible] all these bad things. [illegible] only five inspectors on the [illegible] Environmental Protection's local [illegible] them should not be [illegible] good idea to outfit them with [illegible]. Only when a correct [illegible] effective monitoring controls [illegible] proceed to carry out plans [illegible] alternative industrial [illegible] modernization of metallur[illegible] putting new purification [illegible]

[illegible] and Psychological Problems of Shift Workers in Arctic Ocean Petroleum and Gas Industry

[illegible] ZDRAVOOKHRANENIYE [illegible] in Russian No 1 [illegible] 14 May 93 pp 13-15

[illegible] and Yu. P. Lisitsyn, State [illegible] and Gas [illegible] I. M. Gubkin [illegible] UDC 613.632:622.276

[illegible] working on a [illegible] on the Arctic conti[illegible] to ascertain the impact [illegible] by the [illegible] family life. Since [illegible] and psychologically [illegible] was made to define [illegible] shift personnel [illegible] involved a sample of [illegible] of 290 [illegible] analyses and [illegible] the study group

were analyzed, but special attention also was given to the frequency of occurrence of accidents, which are quite common and result in inability to perform tasks for protracted periods. These were more numerous than in the control. Different afflictions played the most important roles in the study and control groups and the days of work loss were greater in the former than in the latter. Acute, chronic and latent diseases were greater in the study group than in the control group by a factor of 8. A psychophysiological study of the personality was made with respect to 32 parameters, including the implications of introversion and extroversion in subjects of both groups, which are to be taken into account in future screening. A wide range of physiological factors was examined as applicable to professional selection for work in the Far North. The results of the study have been used in formulating rehabilitation programs. References: 17 Russian.

Health and Life Style of Male Migrants Working at an Industrial Enterprise

947C0259B Moscow ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII in Russian No 1, Jan-Feb 94 (manuscript received 17 Feb 93) pp 26-28

[Article by A. A. Modestov and L. G. Perekopskaya, Department of Social Hygiene and Public Health Organization, Russian State Medical University, Moscow; UDC 616-055.1-02:614.1]:313.13]-07]

[Abstract] A study was made to determine the influence of movement and life style of migrants on their health and to formulate recommendations on upgrading the [illegible] and work performance of males arriving at an industrial plant in Krasnoyarsk, Eastern Siberia, from different regions of the country. The total migrant [illegible] residence 6 months-13 years) was 34.48 [illegible]. The study sample was made up of 635 males; the control group consisted of an equal number of locally born males. The sample was then broken down into three age groups, work categories and regions of origin. Among the [illegible] considered were education, family makeup and [illegible] conditions (a total of 34 variables were [illegible]). Correlation coefficients were found between [illegible] subjective and objective health indices, on the one hand, and [illegible] factors, on the other hand. It was found that the [illegible] factors responsible for an increase in the number and duration of illnesses in decreasing order of correlation with health indices are low education, absence of a family, [illegible] earlier migrations, urban [illegible], low physical activity, poor eating habits, greatest geographical contrast from region of origin, inadequate knowledge about a [illegible] life style and unsatisfactory living conditions. [illegible] among these migrants was [illegible] inhabitants and [illegible] their [illegible] are [illegible] corresponding [illegible]. All [illegible] for the first three [illegible] adaptation. [illegible] employment of [illegible] advantageous [illegible] made available [illegible]

Russian Innovations in Life Sciences [TRUD 13 Oct 93, etc.]

[illegible] 13 Oct 93 [illegible]

[illegible] Report] Materials

[illegible] material obtained by scientists from the Dnepro-[illegible] Medical Institute and the local university's [illegible] department shields against radiation and x-rays [illegible] times better than lead. The material can be used in the [illegible] of protective clothing (Moscow TRUD 13 [illegible]). Pharmaceuticals

[illegible] Medical Institute's Department of Microbi-[illegible] developed a new antiseptic, Miramistin, claimed [illegible] times superior to comparable medicinal [illegible]. Miramistin has undergone successful clin-[illegible] treatment of septic wounds, burns and AIDS (Moscow ROSSIYSKIYE VESTI 29 Oct 93).

[illegible] a pharmaceutical derived from wastes left [illegible] of the sea cucumber Cucumaria, stimu-[illegible] system to combat viral infections and [illegible]. The Pacific Institute of Bioorganic Chem-[illegible] East Division of Academy of Sciences, [illegible] the drug, is preparing it in small batches [illegible] veterinary medicine, where it is effective in 95 [illegible] cases. Kukumariozid is being studied for [illegible] medicine (Moscow ROSSIYSKIYE VESTI [illegible]).

[illegible] Food Industry Institute has developed can-[illegible] tosorbent additives that reduce the [illegible] radiation in human organs. The Bershad [illegible] is manufacturing these candies for sale [illegible] will soon begin production of antira-[illegible] (Moscow NEZAVISIMAYA GAZETA [illegible]).

[illegible] Ear, Nose and Throat Institute have [illegible] technique which uses remaining [illegible] to reconstruct the vocal apparatus [illegible] surgery. The novel method has been [illegible] patients. Ninety-four percent of patients [illegible] days after surgery, and vocal quality [illegible] (Moscow ROSSIYSKIYE VESTI [illegible]).

[illegible] Scientific Production Association Respi-[illegible] developed medical evacuation [illegible] astronauts is producing a model [illegible] field hospital for responding to nat-[illegible] other emergencies. The complex [illegible] structure which is rapidly [illegible] into a pneumatic framework [illegible] climate control, energy [illegible] systems. The customer is the [illegible] and Catastrophe Medicine [illegible] ROSSIYSKIYE VESTI 29 Oct 93).

[illegible] the Russian Federation Health [illegible] State Research Center are [illegible]. The Raduga-1 contact [illegible] the Pleyes Scientific Produc-[illegible] Moscow, is used for bloodless dissec-[illegible] internal organs. The Istok Scientific Production Association near Moscow designed the Raduga-1F laser, which the Center uses for endocoagulation. The press report claims that Moscow scientists' developments in this field are "3-5 years ahead of Western counterparts." The Center, which was created to monitor the field of laser medicine and provide training, has signed a contract to deliver laser equipment to India, train Indian doctors in Moscow, and set up a branch of the Center in Dharwar. Reportedly it has also been negotiating with the Turkish company Asia Ltd., private clinics in Madrid and Paris and the Phillipines Health Ministry (MOSCOW NEWS 1 Oct 93).

Minatom's Moscow Institute of Theoretical and Experimental Physics has developed a new small-scale, portable synchrotron for administering proton radiation treatment to patients with cancers, endocrine disorders and other serious diseases. The institute has treated 2,500 patients and plans to increase its patient load (Moscow ROSSIYSKAYA GAZETA 12 Oct 93).

Reacting to a sharp drop in orders for its scientific developments and acute brain drain, the Samara State Aerospace University imeni Academician S. P. Koroleva is seeking sponsors for production of special vibration [illegible] nozzles designed for urological, stomatological and cosmetological procedures. The mechanism of the therapeutic effect was tested at the Main Military Clinical Hospital imeni N. N. Burdenko, the Central Scientific Research Institute for Physiotherapy and Moscow State Medical University (Moscow DELOVOY MIR 29 May 93).

Fifty million rubles is needed to initiate production of a unique light-conducting disposable needle designed for intravenous irradiation. The newly patented device was developed by the Interlaz Scientific Research Center in collaboration with the Institute of Laser Medicine. Interlaz is unable to afford credit rates and lacks working capital (Moscow DELOVOY MIR 30 Nov 93).

PHARMACOLOGY AND PHYSIOLOGY

Effect of Prolonged Use of Nootropic Drugs on Rats' Brain Activity

947C0232A Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian [illegible]

[Article by S.V. Krapivin and Zh. A. [illegible], [illegible] of Theoretical and Clinical Adaptation [illegible] Meyerson [illegible] General Pathology [illegible] Scientific Research Institute, Russian [illegible] Medical Sciences; UDC [illegible]]

[Abstract] Nootropic [illegible] [illegible] periods [illegible] the effects of three nootropic drugs [illegible] meclofenoxate and [illegible] total of 32 [illegible] male rats [illegible] was studied. [illegible] days for 3 months [illegible]

injections of meclofenoxate in a dose of 70 mg/kg daily for 5 months, and the group 3 animals received IP injections of mexidole in a dose of 100 mg/kg daily for 5 months. The control rats received a physiological solution under analogous conditions. The studies of the bioelectric activity of the rats' brains were carried out when the rats were wide awake and unrestrained. Five to 6 days before the neurophysiological experiments, the rats were anesthetized with nembutal (50 mg/kg IP), and monopolar Nichrome electrodes were implanted into the sensorimotor cortex and dorsal hippocampus of their brains. Fourier spectral analysis of encephalograms [EEGs] of the rats' brains was performed by using a Berg-Fourier Analyzer (O.T.E. Biomedica, Italy) and an analysis period of 4 minutes 8 seconds. Bioelectric activity was recorded in 5-minute segments before and after (for 2-3 hours) injection of the drugs. The studies established that prolonged injection of piracetam results in an intensification and stabilization of the dominant power peak of the θ-range (4-8 Hz) and a simultaneous decrease in the power of the α-range (8-13 Hz). A statistically significant decrease was noted in the fast-wave β-range (13-20 Hz) of the power spectra of the cortex EEGs. In the hippocampus, on the other hand, piracetam induced a decrease in the relative power of the θ-range (although it still exceeded the values found for intact animals). At the same time there was a decrease in the power of the α-range and an increase in the power of the β-range (13-32 Hz) of the spectra of the EEGs of the hippocampus when compared with the values obtained for one-time administration of piracetam in intact animals. Discontinuation of piracetam did not cause any drastic changes in bioelectric activity or in the respective power spectra of the EEGs of both brain structures studied. Prolonged administration of meclofenoxate was found to [illegible] the EEG power spectra [illegible] recorded for the cortex. Not [illegible] demonstrated that the [illegible] significant [illegible] because [illegible] rhythm with [illegible] Hz [illegible] fluctuations [illegible]

effects of the three drugs were confirmed by observations of the rats' behavior: All three drugs increased the rats' levels of wakefulness and excitability. Figures 2, table 1, references 14: 10 Russian, 4 Western.

Comparison of the Effects of Haloperidol During Systemic Administration and Injection Into the Rat Striatum

947C0232B Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian Vol. 56 No. 1, Jan-Feb 93 (manuscript received 13 Mar 91) pp 11-13

[Article by A.F. Yakimovskiy, Physiology of Higher Nervous Activity Laboratory (head, V.T. Shuvayev, candidate of biological sciences), Physiology Institute imeni I.P. Pavlov, Russian Academy of Sciences, Saint Petersburg; UDC 615.214.21.032.813.2.036.07[illegible]]

[Abstract] The effects of haloperidol administered via repeated intraperitoneal [IP] injection (2 mg/kg) were compared with those of haloperidol administered via bilateral injection into the striatum (5 µg) of male Wistar rats weighing 200 to 250 g each in two series of experiments that each involved two groups of rats. In series 1, nine rats received 0.3-ml IP injections. The animals in group 1 received haloperidol in a dose of 2 mg/kg, and those in the control group were injected with a physiological solution. In series 2, 10 rats were injected with haloperidol bilaterally into the rostral [illegible] striatum through cannulas that had been [illegible] them while they were anesthetized. The [illegible] implanted into the group 1 animals were [illegible] percent haloperidol solution sufficient for [illegible] of injections, whereas the cannulas implanted in [illegible] 2 animals were filled with a physiological [illegible] injection had a volume of [illegible] [illegible]

system in the pathogenesis of cataleptic rigidity. The authors explained this phenomenon by stating that local injection results in different pharmacologic loads that do not trigger catalepsy but that instead induce akinesia similar to parkinsonian akinesia. They further stated that consideration must be given to the fact that in the case of systemic injection, neuroleptics exert a mediated effect on the central nervous system through somatic systems (for example, because of a change in the content of metals in blood plasma, which in turn results in a whole set of biochemical disorders). Figure 1; references 10: 6 Russian, 4 Western.

Effect of μ-, δ-, and χ-Opiate Receptor Agonists on Biological Activity of the Viscerosomatic Convergent Neurons of the Spine's Dorsal Horn

947C0232C Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian Vol 56 No 1, Jan Feb 93 (manuscript received [illegible])

[Article by S.A. Kasparov, Pharmacology Department (head: D.A. Kharkevich, academician Russian Academy of Medical Sciences), Medical Department, Moscow Medical Academy imeni I.M. Sechenov, Moscow; UDC [illegible]]

[Abstract] A study examined the effects of selected μ-, δ-, and χ-opiate receptor agonists on the activity of the viscerosomatic convergent neurons of the spinal dorsal horns of male ICI Wistar rats (weight, 250-350 g) that had been implanted with cutaneous and visceral single-channel glass microelectrodes. A Cardio 80 computer (Contron) was used to analyze the neurons' activity and to plot poststimulation histograms. The rats' somatic afferent [illegible] were stimulated by measured squeezing of the skin [illegible] rear extremity. Their pelvic afferent [illegible] stimulated by blowing into a thin-walled [illegible] that had been inserted into their rectums and [illegible] of their sigmoid colons. Both types of stimulation were accomplished by devices permitting [illegible] the duration and intensity of stimulation. [illegible] experiments the rats were anesthetized with [illegible] immobilized with Flaxedil, and kept warm [illegible] temperature was kept at 37°C, and the [illegible] expired air was maintained at 3.5-4 volume [illegible] When a rat's arterial pressure dropped below [illegible] the experiment was halted. The following [illegible] to the rats: morphine (10^{-7} to 10^{-3} M [illegible] [5 x 10^{-7} to 10^{-2} M] dalargin [illegible] (10^{-5} to 10^{-3} M), dalargin (10^{-5} to 10^{-3} M), U-50488H (10^{-5} M), dynorphine$_{1-13}$ (10^{-4} [illegible]. The μ-opiate receptor agonists morphine and DAGO, and the δ-opiate receptors D-Pen- and [illegible] and Metkefamin suppressed the bioelectric activity of convergent neurons of the dorsal horns [illegible] The suppressive effects of all of the [illegible] concentration dependent and [illegible] When the aforesaid drugs were [illegible] sometimes suppressed reactions to [illegible] more strongly than they [illegible] stimulation. When [illegible] morphine had an identical effect [illegible] on suppression of both types of stimulation. Ligands of the χ-opiate receptors U-50488H and dynorphine$_{1-13}$ were not found to have any statistically significant effect on the bioelectric activity of the convergent neurons of the rear horn of the spine. Tables 2; references 16: 4 Russian, 12 Western.

Effect of Ouabain on the Cardiovascular System of Rats With Chronic Cardiac Insufficiency

947C0232D Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian Vol 56 No 1, Jan Feb 93 (manuscript received [illegible]) pp 31-33

[Article by Ye.A. Gorokhovskaya, L.A. Alekseyeva, and O.S. Medvedev, Experimental Pharmacology Laboratory (head: O.S. Medvedev, doctor of medical sciences), All-Russia Cardiology Scientific Center, Russian Academy of Medical Sciences, Moscow; UDC [illegible] .03:616.12-008.46[07.8]]

[Abstract] Wistal rats were [illegible] (40 mg/kg). Polyethylene [illegible] were inserted into each rat's left ventricle through its right carotid artery. The coronary vessels of seven rats were embolized [illegible] of 15 μm by radioactive microspheres injected into the cavity of the left ventricle during systole [illegible] ascending aorta. The seven control rats were subjected to pseudo-operations during which they were subjected to the same procedures performed on the rats in the experimental group. During the infusion procedure, however, they received a physiological solution instead of [illegible] spheres. Twenty-one chronic [illegible] rats that had been implanted with catheters [illegible] artery and jugular vein 3 days before the [illegible] were selected for testing. Indicators of the rat's [illegible] and regional hemodynamics in response to [illegible] bare infusion [illegible] a dose of 0.4 mg/kg [illegible] constant rate of 2 ml/min for 3 minutes [illegible] studied while the rats were [illegible] awake. At the [illegible] tests the rats were [illegible] were [illegible] their [illegible] removed [illegible] microspheres [illegible] [illegible] microspheres to blood [illegible] When compared with the control rats, the arteries had been [illegible] diastolic pressure [illegible] cardiac output [illegible] flow in the [illegible] adrenal glands, and [illegible] ouabain administration [illegible] dilatation [illegible] and [illegible] changes [illegible] were [illegible] possible [illegible] on [illegible] stimulation [illegible] decrease [illegible] pleural [illegible]

[illegible] total amount of microspheres injected into the rats, 34 [illegible] percent ([illegible] 106.278 +/- 23.720 g) ended up in the heart as a whole. These findings confirmed that 21 days after embolization, rats with symptoms of cardiac insufficiency (heart failure) induced by embolization of their coronary vessels are more sensitive to the glycoside ouabain than are rats with no symptoms of heart failure and that coronary vessel-embolized rats may therefore serve as suitable models for studying the status of a cardiovascular system with [illegible] heart failure. Figure 1, tables 2, references [illegible]: [illegible] Russian, 11 Western.

Peptide Modulation of Immune Responses

[illegible] Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian [illegible] No 1, Jan-Feb 93 (manuscript received [illegible])

[Article by M.A. [illegible], G.V. [illegible]dova, and O.S. Pap[illegible], [illegible] Modulation Mechanisms Laboratory [illegible] Prof. [illegible] Devoyno, Physiology Institute, Siberian Department, Russian Academy of Medical Sciences, Novosibirsk; UDC 615.357.[illegible].175.82] [illegible]

[Abstract] Peptide modulation of immune responses was studied in [illegible] CBA mice of both sexes (weight 20 to 25 [illegible]) [illegible] obtained from the Organic Synthesis [illegible] Academy of Sciences in Riga were [illegible] in doses of 0.001, 0.01, 0.05, 0.1, [illegible] and its analogue [illegible] had the [illegible] stimulating effect at all doses tested. As [illegible] was increased, the number of [illegible] and rosette-forming cells [RFC] [illegible]. When the tripeptide SKE was used, the [illegible] at a dose of 0.1 mg/kg, and when [illegible] immune system stimulation [illegible] (0.001 mg/kg). A vasopressin [illegible] the amino acid glycine in its [illegible] number of RFC in the mice only [illegible] at a dose of 1 mg/kg. An increase in [illegible] was also discovered in [illegible] P and its analogue. Among those [illegible] suppressive function, the vaso[illegible] (expansion not given) [illegible] suppressive effect. The [illegible] appeared in a narrower [illegible] was administered was [illegible] SKD manifested a strong [illegible] capable of affecting [illegible] simultaneously. The [illegible] peptides [illegible] amino acids [illegible]

Systems Analysis of the Effect of Psychotropic Agents on the Training Process

947C0232F Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA [illegible] Vol 56 No 1, Jan-Feb 93 (manuscript received 29 Sep 92) pp 62-64

[Article by A.I. Mach[illegible], [illegible], and [illegible] Barkov, Medical Biotechnology [illegible] Center, Russian Federation [illegible]; UDC 615.214:015.4:612.821] [illegible]

[Abstract] A new systems approach [illegible] of psychotropic agents [illegible] posed. The approach [illegible] parameter recording method that [illegible] behavioral indicators and processes [illegible] inal mathematical programs based [illegible] theory and data analysis theory. The [illegible] systems approach to evaluating the effects [illegible] on the training process [illegible] behavioral indicators [illegible] latent period, number of responses [illegible] of response to them, number of [illegible] number of nonpurposive responses [illegible] for which the animal was [illegible] crossbar. These seven indicators [illegible] accordance with the animal's [illegible] to light and failure to respond [illegible] cessing, the seven series of [illegible] formed into 20 derivative [illegible] response and failure to respond [illegible] then transformed into [illegible] cators. The matrix was [illegible] diagnostically significant [illegible] characterize the animals [illegible] points. The proposed systems [illegible] examine the effect of [illegible] 9-tetrahydrocannabinol (D-9-THC) [illegible] on animals' ability to learn [illegible] The behavior of the [illegible] tions was compared with [illegible] daily injections of [illegible] the first experiments [illegible] injections of D-9-THC [illegible] execute conditioned [illegible] period of [illegible] latent period of response [illegible] the length of [illegible] remain [illegible] [illegible] ability to [illegible] gradually [illegible] [illegible]

memory, and the role of the emotional component in their decision-making process increased slightly as compared with that in the control animals. Figures 2; references 6: 3 Russian, 3 Western.

Capsaicin—A Physiologically Active Substance

947C0232G Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian Vol 56 No 1, Jan-Feb 93 (manuscript received 8 Jun 90) pp 67-69

[Article by N.A. Mokhort, Kiev Scientific Research Institute of Pharmacology and Toxicology (director, Prof. I.S. Chekman), UDC 615.322:547.944.3+615.21:547.944.3] (048.8)]

[Abstract] Capsaicin is a naturally occurring physiologically active substance that has until recently remained little studied despite the fact that it is used widely in everyday life and in medical practice. Studies conducted in the past few years have demonstrated that capsaicin reacts with the C-fibers of the autonomic nervous system, facilitates the removal of substance P from the latter, and thereby lowers a patient's sensitivity to pain. Capsaicin has also been shown to affect the respiratory and cardiovascular systems and smooth musculature. Toxicity studies have established that capsaicin has a DL_{50} of 1.1 to 120 mg/kg, guinea pigs being most sensitive to it (DL_{50} = 1.1 mg/kg) and hamsters being least sensitive to it (DL_{50} = 120 mg/kg). Its toxicity is highest when injected intravenously [IV] and lower when administered rectally or applied cutaneously. Three minutes after IV injection into Sprague-Dawley rats, capsaicin is already detectable in their brain, spinal cord, and liver in amounts several times higher than in their blood. When injected subcutaneously, capsaicin reaches its maximum levels in the tissues and blood after 5 hours. After 48 hours, rats that had received capsaicin in doses of 20 mg/kg had excreted 8.7 percent unchanged and in the form of eight metabolites. Capsaicin has a lasting antinociceptive effect. When administered in an aerosol (2.8 μmol/l), capsaicin stopped coughing in test subjects without altering the depth or frequency of respiration. When used as an inhalant, it has been shown to increase the minute volume and average frequency of respiration. In anesthetized dogs, capsaicin injected IV in doses of 10 to 300 mg/kg has induced a short-term increase in mean arterial pressure followed by a long-term decrease. Its hypotensive effect in dogs and rabbits has been attributed to cholinergic mechanisms but not ascribed to any effect on the heart. Capsaicin has also induced relaxation of an isolated hand of porcine coronary artery that was accompanied by hyperpolarization of the smooth muscle only in the presence of endothelium and has had various effects on isolated segments of guinea pig ileum depending on the concentration in which it was administered. Capsaicin's main targets are the central and peripheral nervous systems. When injected intraperitoneally into guinea pigs in doses of 0.128 to 0.15 mg, it attenuates behavioral responses to irritants in areas such as the eye and nose. Practical application of capsaicin is based on its predominant reaction with the peripheral receptive formations of sensory nerves. It is highly selective and it manifests its stimulating properties when diluted to concentrations as low as 1:11,000,000. References 31: 1 Russian, 30 Western.

Effect of Normase on Indicators of Lipid Peroxidation in Cases of Toxic Liver Injury

947C0232H Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian Vol 56 No 1, Jan-Feb 93 (manuscript received 4 Jun 91) pp 60-62

[Article by D.G. Uzbekova, A.N. Ryabkov, and G.B. Artemyeva, No 2 Internal Diseases Department with a Course in Clinical Pharmacology (head, Prof. Yu.A. Andrianov), Ryazan Medical Institute imeni I.P. Pavlov, Ryazan, UDC 616.36-02:615.9-085.355]

[Abstract] The effect of normase on indicators of lipid peroxidation in cases of toxic liver injury was studied in a group of nonpedigree male albino rats weighing 170 to 250 g in which toxic liver injury had been induced by 3 days of intramuscular injection of a 50 percent oil solution of carbon tetrachloride (2 ml/kg). The metabolism of tetrachloromethane occurring in the endoplasmic reticulum of the hepatocytes was accompanied by the formation of free radicals inducing lipid peroxidation and subsequent development of hepatosis-hepatitis. The rats were injected with normase in 1-ml doses once daily for 3 days. The intensity of free-radical oxidation was determined by the concentration of malonic dialdehyde [MDA] in their liver tissue, brain, and erythrocyte membranes. The data were subjected to standard analysis of variance methods and Student's t-test. As expected, tetrachloromethane induced significant accumulation of MDA in the substrates studied. The induced level in liver homogenate exceeded the starting levels by 110 percent, that in the animals' brain tissue exceeded the starting level by 59 percent, and that in their erythrocytes exceeded the starting levels by 93 percent. The concentration of SH groups in the said tissues decreased by 33, 34, and 38 percent, respectively. Normase was not found to have any direct effect on the mechanism of primary liver injury. It did not change the activity of free-radical oxidation in hepatic tissue; however, it did facilitate normalization of the parameters of lipid peroxidation in the membranes of the study animals' erythrocytes and in their brain tissue. Tables 2; references 14: 11 Russian, 3 Western.

Effect of Nooglutil and Piracetam on Various Operant Learning Forms

947C0243A Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian Vol 56 No 2, Mar-Apr 93 (manuscript received 30 Aug 92) pp 6-9

[Article by A.N. Inozemtsev, T.I. Garibova, T.V. Kuromova, R. Alvares, T.A. Voronina, N.A. Tushmalova, Laboratory of Psychopharmacology, Institute of Pharmacology, Russian Academy of Medical Sciences, Moscow; Department of Higher Nervous Activity, Moscow State University, Moscow; Biological Faculty, Moscow State University, Leninskiy Gory, Moscow, UDC 615.214.31:015.4:612.821]:076.9]

[Abstract] This article studies the effect of new nootropic action substances, nooglutil (N-(5-hydroxynicotinoil)-L-glutaminic acid, OHK-10) and piracetam, on the initial stages of the formation of various types of operant behavior in rats, namely avoidance learning in a shuttle box and a Skinner box, and on the T-maze reflex with a water reward. Comparison with data obtained from the three methods permitted differential evaluation of the effects of the drugs on learning. Nooglutil and piracetam have no effect on avoidance learning in a shuttle box or on the T-maze reflex. In a Skinner box, nooglutil accelerated the formation of the escape and avoidance responses, while piracetam improved only the escape response. The reason for enhanced performance in a Skinner box is that the inherent worsening of performance due to ambiguous cause and effect relations is countered by the nootropic drugs. Nootropic drugs have no effect on the formation of memory pathways in conditions that are not accompanied by functional disruption of higher nervous activity in both positive and negative reinforcement. Figure 1; table 1; references 15: 12 Russian, 3 Western.

Study of Mechanisms of Anxiolytic Action of 1-(2-Pyrimidinyl)-Piperazine Derivatives, Serotonin Agonists

947C0243B Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA in Russian No 2, Mar-Apr 93 (manuscript received 12 Aug 91) pp 11-13

[Article by A. N. Talalayenko, N. A. Kharin, Department of Pharmacology, Clinical Pharmacology of the Gorkiy Donetsk Medical Institute, Donetsk; UDC 615.214.32.015.4.07]

[Abstract] Derivatives of 1-(2-pyrimidinyl)-piperazine (ipsapirone and campirone) injected intraperitoneally or into the dorsalis nucleus raphe and dorsalis hippocampus of rats revealed dose-dependent anxiolytic action in avoidance procedure and conflict situations. Microinjections administered locally into the nucleus raphe and hippocampus revealed the role of the serotoninergic mechanisms of these brain formations in the studied anxiety conditions of varied aversive genesis. Injections of ipsapirone and campirone into the nucleus raphe elicited anxiolytic effect in various types of tests. Chemical stimulation of the hippocampus elicited an anxiolytic effect in several (ipsapirone) or isolated (campirone) tests. Dissociation of anxiolytic effects in tests of differing aversive genesis, due to the introduction of 5-OT and its agonists into the nucleus raphe and hippocampus, may indicate the ambiguous neurochemical effect of these substances, and the presence of a non-serotoninergic component in the mechanism of anti-anxiolytic action of derivatives of 1-(2-pyramidinyl)-piperazine. Tables 2, references 11: 3 Russian, 8 Western.

Radiation Protection Properties of 2-[Aminoalkyl]-Aryltetrazoles

947C0214A Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No.3, Mar 93 pp.33-36

[Article by V.G. Kitayeva, R.I. Ishmetova, G.L. Rusinov, R.M. Malkina, Ye.I. Tolstykh and T.N. Tuzhilkova (deceased) [Fine Organic Synthesis Department, IOKh [Organic Chemistry Institute], UrO [Ural Department], RAN [Russian Academy of Sciences], Yekaterinburg; Biophysics Institute, RF [Russian Federation] MZ [expansion not given], Moscow)]

[Abstract] Earlier the authors had synthesized new biologically active tetrazole derivatives that turned out to have radiation protection properties. Continuing their search among tetrazole derivatives for new radiation protectors the authors obtained 27 different (2)-aminoalkyl-5-substituted- aryltetrazoles identified as I-XXVII. Their properties are presented. Also presented are toxic and radiation protection properties for N_2 isomers and their salts. Nine derivatives exhibited a 40-80% radiation effect under an $LD_{05.99.30}$ exposure. A relationship between their structure and action was observed. The most detailed study of radiation protection properties was conducted for compound XIV. It maintains its protection properties for 3 hours after exposure. Chemical and biological experiments were performed. The obtained data indicate that tetrazole class is promising in a search for radiation protectors. Tables 4, references 9.

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